Founded March 1, 1874—Fifty Years of Service

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Electrical World

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The Fynn-Weichsel Motor—the motor that corrects power-factor. Central station men expect this motor to play a large part in solving one of their most serious problems.

The Wagner Pow-R-full Motor—the first motor to be cooled by scientifically directed draft. A heavy duty induction motor of squirrel-cage type.

The Wagner Pow-R-full Starterless Motor. Just throw a switch to start it. Combines the starterless idea, originated by Wagner, with the directed draft feature and sturdy construction of the Pow-R-full squirrel-cage motor.

Early Wagner Type BA Single-phase Motor exhibited at the 1924 N E L A Convention, after twenty-seven years of continuous service.

The Wagner Type BA Single-phase Motor of today. Repulsion starting, induction running. Exerts a heavy starting torque and has well balanced all-around characteristics.

The Wagner Type BR "Slip Ring" Motor. Variability of speed and torque is the chief feature of this highly useful motor.

The Wagner Type BB Single-phase Motor—Split-phase. A popular small motor, made in sizes from one-eighth to one-half horsepower.

WAGNER FANS
A new member of the Wagner Quality family—the fans with 38 selling features.

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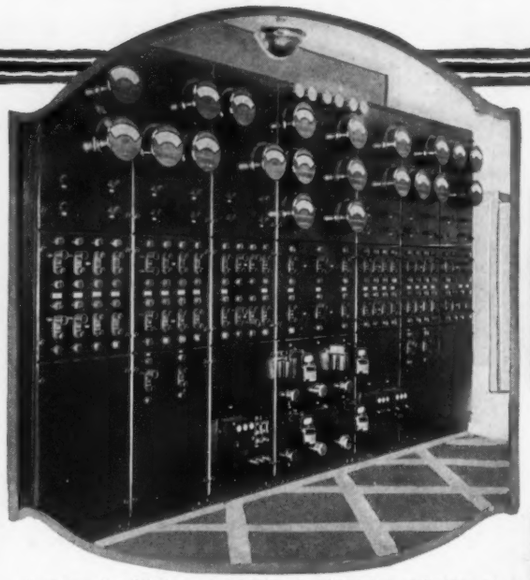
past — present — future



Section of a Weston equipped central station switchboard

Weston on an Instrument means Dependability in It

The use of Weston instruments have become world-wide because of their continuous dependability. Many engineers, who have had Weston switchboard installations for twenty-five years or more, are always glad to give Weston instruments the credit they deserve. Anywhere you go, you will find Weston instruments giving the highest degree of accuracy and serviceability.

Weston Instruments are a permanent investment. Once installed, they will last a lifetime with reasonable care.

Altogether, several million users have purchased Weston instruments and this is exclusive of the radio field.

As a pioneer and leader in the development and manufacture of electrical indicating instruments for the past 36 years in every branch of the electrical industry the Weston Electrical Manufacturing Company has brought forth many new instruments. The latest model is the new line of Weston Rectangular Switchboard instruments. If you are not familiar with this new model, write for Booklet 1504.

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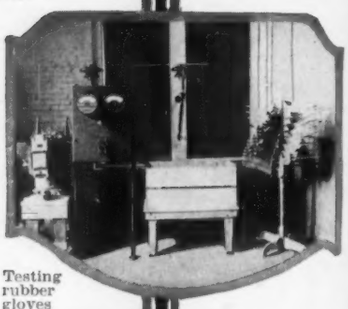
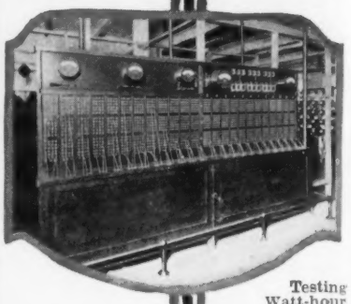
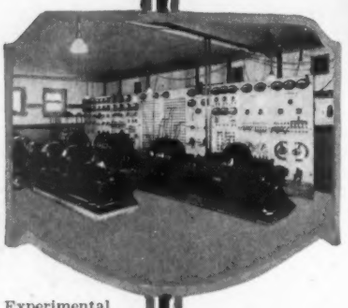
STANDARD - The World Over



Testing rubber gloves



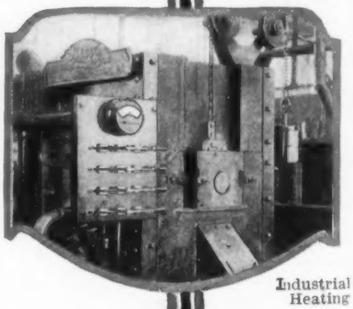
Testing Watt-hour meters



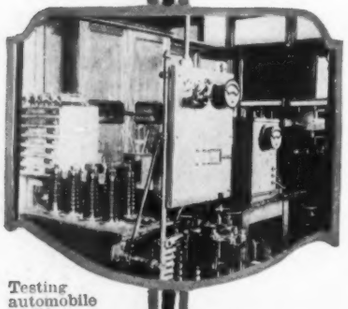
Experimental laboratory

Wire Chief's Instruments

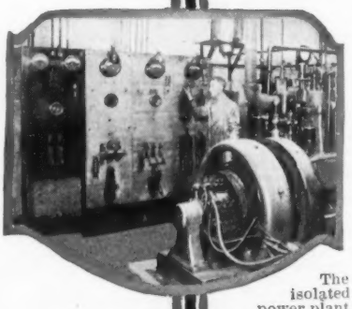
Electro plating



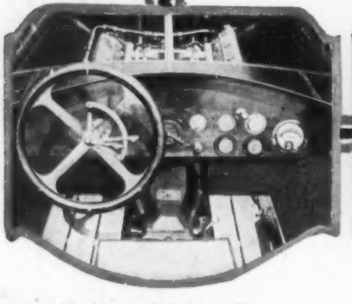
Industrial Heating



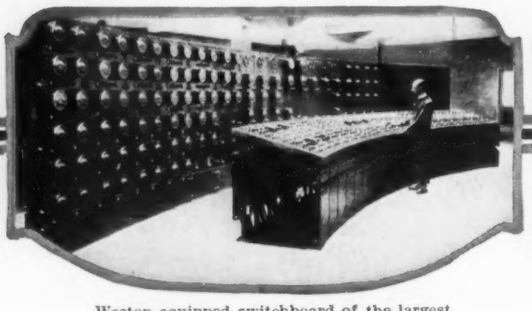
Testing automobile ignition



The isolated power plant



Weston equipped speed boats and automobiles



Weston equipped switchboard of the largest industrial plant in the world

Weston for every radio need

Electrical World

THE CONSOLIDATION OF ELECTRICAL WORLD, ELECTRICAL ENGINEER AND AMERICAN ELECTRICIAN

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W. H. ONKEN, JR.
Editor

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Water-Power Development in the State of New York

GOVERNOR SMITH in his annual message to the Legislature of New York again recommends the development of the water powers of the state. While he becomes eloquent on the subject, he fails to understand that he himself, through his public-ownership policies, is the chief stumbling block to development. He needs a Nathan to say to him, "Thou art the man!" The water-power development that has taken place in New York—and last year's addition was about 100,000 hp.—has been made by private interests. Not one horsepower in use stands to the credit of the state. Indeed, the attitude of New York is in sharp contrast to that of the national government. The latter, through its Federal Power Commission, has since its inception received applications for the development of more than 21,000,000 hp., of which almost 3,000,000 hp. is completed or under construction, whereas the water powers belonging to the State of New York are still flowing to waste because the privately owned and publicly regulated utilities which seek to harness them for the good of the state are denied that right. The federal government, on the other hand, has established and followed a definite and enlightened water-power policy under which there has been more development in two years than in all the previous years since the foundation of the Republic. The Governor is right when he says the water powers of New York should be utilized. It is an economic crime to permit them to go to waste, and any policy which keeps them in that condition can hardly be worthy of so popular a governor as "Al" Smith or in keeping with enlightened public policy.

Municipal Utility Employees Subject to Income Tax

THE assessment of taxes on employees of municipally owned water, gas, light and traction systems has been ordered by the Bureau of Internal Revenue. Far-reaching as is the ruling of the Treasury Department, it is based on court decisions in several sections of the country which have held that employees of municipally owned institutions acting in a proprietary capacity rather than serving governmental purposes are subject to income tax in their compensation. Thus a stop is put to income-tax evasion and employees of municipal plants are put on the same footing as employees of electric light and power companies.

The extent to which the community and the government are deprived of income by municipally owned systems is not appreciated by the voter. For example, the rates for service in Seattle, Wash., which has a municipally owned system supplying electricity in competition with a privately owned and publicly regulated utility, are the same in both systems. Yet the former pays no taxes to speak of, was erected with money raised on tax-exempt securities, and its income as well as that of its employees is also tax-exempt. The privately owned utility, on the other hand, paid in taxes in 1923 more than one million dollars and last year paid out in interest and dividends, not to mention salaries, approximately five million dollars, all of which was subject to income tax. Yet, notwithstanding this outlay, it supplied electric service at the same rates as the Seattle municipal plant. The electrical industry does not object to paying taxes. It does object to discrimination in taxes, however, and the ruling of the Treasury Department is a recognition of the fact that discrimination in taxes does exist.

Prizes Available to Employees of Public Utility Companies

TO STIMULATE interest in all phases of electric public utility work, the National Electric Light Association is offering a number of prizes to employees of member companies. Heretofore only three prizes have been available. This year there will be twice as many, and the cash awards are quite substantial. Naturally, keen competition for the prizes will follow, and it is in this rather than in the awards themselves that chief interest centers. To compete for the prizes it will be necessary for the contestants to study, observe and think and then to reduce the product of this mental activity to writing, thus doubly impressing their conclusions of their consciousness. The result will be a contribution of more or less value to the industry, but of greater value to the producer. This, after all, is the objective sought, for no public utility organization can be greater than its component parts.

The Doherty medal donated by Henry L. Doherty, the Frank W. Smith educational prize of $100 in gold and the Harriet Billings prize of $50 (this year donated by W. C. L. Eglin of Philadelphia) remain the same. Additional prizes are made available for papers on subjects relating to the four sections of the national association. They are the H. M. Byllesby prizes of $250, $150 and $100 for papers on accounting; the Martin J. Insull prize of $250 for the best paper on public relations, the James H. McGraw prizes of $250, $150 and $100 for the best technical papers, and the Arthur Williams prize of $250 for the best paper on any commercial subject relating to the electric light and power industry. In addition to all these awards a medal established by Samuel Insull is granted at various times throughout the year for noteworthy accomplishments in the resuscitation of life by the prone-pressure method. For the companies themselves there is, of course, the Coffin medal and award.

These regular annual awards, supplemented by such

special events as the home-lighting contest for central-station employees just announced by the N. E. L. A., with prizes of $500, $300 and $200, and by many competitions in individual companies—for example, the Brooklyn Edison Company's prize of $150 for the employee writing the best final chapter for its employees' manual—are bound to increase company morale and enthusiasm. In affording a counteractive to the inevitable tendency of modern industrial life toward standardization and bureaucratic routine they appeal to that honorable ambition of the individual that has always been a tremendous driving force in human affairs.

Export of Electricity from Canada

OUR Canadian friends are again somewhat perturbed over various American superpower schemes which seek to draw on Canadian hydro-electric resources. What Canadians fear is that power once exported is always exported, and there is more fact than fancy in the suggestion, although the situation is by no means serious for them.

Water power is a replenishable resource, and so long as "God loves an idle rainbow no less than laboring seas" Canada's water powers will remain inviolable. Americans export a non-replenishable resource—coal—to Canada, and as between a replenishable and a non-replenishable resource the United States admittedly is the greater loser, and yet we do not complain.

Besides, the export of electricity is not without value to Canada. Mutual as are the advantages to both countries, many power stations in Canada would not have been built were it not for the American power market. Thus capital is invested and labor set to work on Canadian soil. Now, power is of no use unless sold, and if the United States purchases Canada's surplus of what would otherwise go to waste and seeks to employ what now is not in use, does she not enrich rather than impoverish the land of the maple leaf?

Continue Impartial Professional Standardization Work

ONE of the most important phases of the work of the American Institute of Electrical Engineers, although a phase perhaps not generally followed by the rank and file of its membership, is that of establishing and maintaining electrical standards. The present edition of the "Standards" is a book of some 130 pages chuck full of definitions, tables, specifications, recommendations, etc., established as a result of long years of evolution of engineering experience and of many heated discussions among committee members.

However much this or that standard may be criticised by a maker, user or seller of this or that electrical device, the work as a whole undoubtedly represents a continuous earnest effort of the cream of the profession to crystallize such experience as has proved in the past to be for the best interests of the largest number of those concerned. In particular, there is no evidence of "letting the bars down" in order that a large amount of inferior equipment may be sold at once. On the contrary, the spirit of the recommended values and tests is to insure that a piece of apparatus once sold remains sold by being reliable and giving long service.

It is only natural that there should be serious differences of opinion on specific points among the members of the committee, but as long as it has been a fair and free-for-all continuous fight, not influenced by selfish commercial interests, the profession and the industry could watch it with equanimity and satisfaction, knowing that truth usually springs from the impact of opinions.

Of late there have been some rumors of differences of opinion in the committee on standards, differences that suggest the possibility of an outside influence of definite groups in the industry, with their immediate commercial interests, rather than of the profession itself, interested only in impartial truth. We hope that these rumors are unfounded and that the Institute management and the committee itself are strong enough to resist any unwarranted intrusion or influence. The general acceptance of the Institute standards by the country at large and their international standing is due entirely to confidence in their impartiality, as differing from the standards established by various other organizations in the industry. In spite of the growing complexity of the industry and the multiplicity of interests involved, it is to be hoped that the Institute standards committee will continue to function as an impartial professional engineering group for producing the technical standards needed as guides and as primary standards of performance by which minor *ex parte* recommendations can be judged.

Lightning Disturbances on Transmission Lines

SINCE the time of Franklin there has been no question as to the electrical nature of lightning, but not until recent years have we been able to approach a reasonable certainty as to the particular forms and values taken by this marvelous and all-powerful natural phenomenon. The danger from lightning to transmission lines and the importance of the elimination of this danger have incited electrical investigators to a study of lightning discharge in all its forms and its effects on transmission lines in an effort to discover protective methods. Through many years few or no definite results were obtained, and observations were limited to the effects of lightning on apparatus, supplemented by the study of the performance of lightning arresters. The methods of direct attack have consisted of spark-gap studies, oscillographic records and other allied methods for studying the time element involved in lightning discharges, and more recently of studies of the potential gradients during lightning storms as in the work of Norinder. None of this work has warranted definite conclusions as to either the exact nature of the discharge or the voltage values, although there has been a general feeling that electric disturbances on transmission lines are electrostatically induced in origin and generally consist of steep wave-front pulses or very heavily damped oscillations of short duration.

Important new data as to the nature and quantitative values involved in lightning disturbances on transmission lines are contained in a paper by F. W. Peek presented before the Pasadena convention of the A. I. E. E. Not only does the paper discuss the nature of lightning disturbances, but it presents experimental evidence as to the values of voltages induced by lightning in transmission lines, and also as to the protective values of

ground wires. Speculation as to the nature of lightning discharges, based on indirect and remotely connected observations, always leaves a large element of doubt in one's mind, and some of this type of speculation is to be found in Mr. Peek's paper. On the other hand, he presents most important direct experimental evidence in his tests on artificial clouds and lines, utilizing the results of his recent well-known high-voltage experiments and his lightning generator. He has applied these to a laboratory model of clouds and transmission lines, on reduced scale, and has studied the relation of cloud potential to the voltages induced in lines by cloud discharge. From these figures he is able to make deductions as to the relations between line insulation and possible lightning disturbances. The measurements and the conclusions are far from exact and are undoubtedly subject at some points to criticism and difference of opinion.

In the main, however, the conclusions carry the stamp of probability as to the correct orders of magnitude. For example, many transmission engineers will probably take exception to the figures given for the degree of protection afforded by overhead grounded wires, and much evidence, based on practice, could be adduced in support of this criticism. It is probable, however, that differences of opinion of this character are to be explained by conditions in existing ground lines as regards their resistance and inductance. The paper points out the importance that these quantities be reduced to their minimum values, and it is highly probable that the low values demanded for best protection are difficult to obtain and maintain on every type and locality of line.

The Cost of Daylight Receiving Greater Consideration

ADVANCEMENT in the production and use of artificial light can be emphasized in no better way than by the increasing tendency to depend upon it even in the daytime. A score of years ago artificial light was still a poor competitor with daylight. It was considered to be merely a feeble substitute by means of which the hours of industry or of recreation could be extended after a fashion. Today artificial light compares favorably with daylight in efficiency, does not always cost more and has many advantages in controllability and dependability.

Until recently the provision of ample daylight was a matter of habit in the design of buildings. Of course, architects knew it cost something to install and maintain daylighting equipment, but most persons even now are not conscious of this cost. Many charges may, however, be made against daylight and its total cost is startling. Men are likely to continue to use daylight where it can be obtained readily and without excessive cost and are likely also to install windows for the purpose of "letting vision out." But it is interesting to note that a growing recognition of the low cost, reliability and ease of control of artificial light is causing architects and others to scrutinize more carefully the cost and other characteristics of daylight.

On every hand in large cities there are places where daylighting equipment is not delivering natural light as satisfactory in quantity and distribution as it should be if its cost is to be justified. Although in special cases artificial light is now used exclusively, there are many cases where it would be best at the present time to effect a compromise. In other words, it would be better to utilize daylight only to the extent to which it can be obtained readily, at reasonable cost and with satisfactory results, and to invest the saving in providing better artificial light, which, when daylight fails entirely, must provide all the lighting. It is interesting to note that progressive architects are beginning to consider lighting problems on this basis. The lighting specialist will render a valuable service in bringing to the attention of architects and others this new viewpoint which efficient, dependable and controllable artificial light has made economically possible.

Business Features of Power-Factor Correction

A LIGHT and power company approaches the study of power factor from the standpoint of delivering cheaper and better service to customers. Customers in turn approach the subject from the same standpoint, but in the initiatory stages accent the cost element in the service and not the quality element. Both producers and users are interested in power-factor correction from a business angle and institute or reject it on the basis of its being good business or bad business as the case may be. Sometimes engineers are apt to forget this psychology, and very frequently they lessen the effectiveness of their proposals by accenting technical aspects of the subject too greatly or by suggesting remedies too precise, too complicated or too technical to appeal to the business judgment of their executives. A grand-average result is all that can be attained for a system, and this is all that is desirable in most cases.

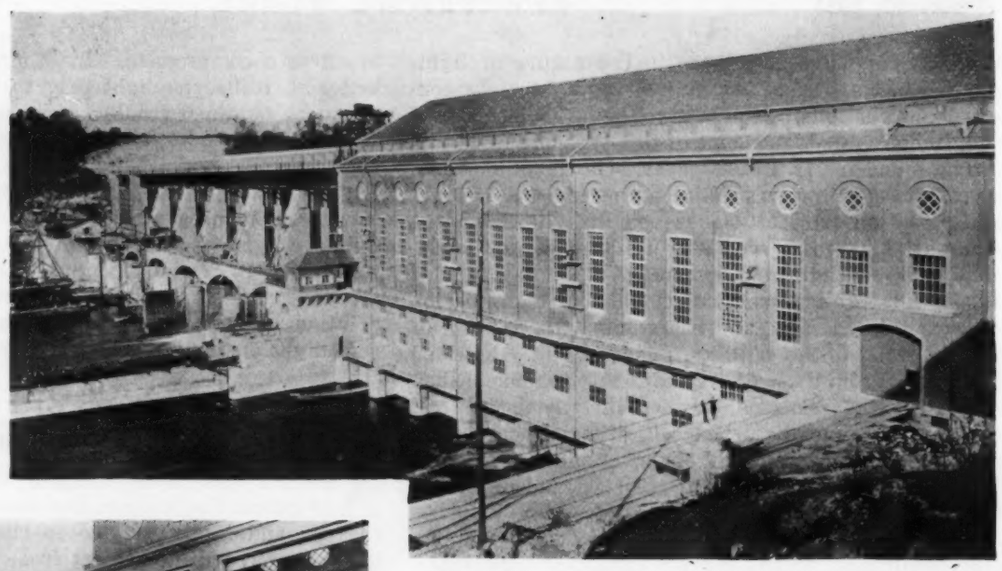
The business approach to power-factor correction is usually made by striking a balance between the cost of low power factor and the cost of correction. Next comes the study of a business method for instituting correction as a part of the business program whereby the financial inducements for correction can be obtained commercially by the utilities and by their customers with a minimum of cost and a minimum of complexity in organization and operation.

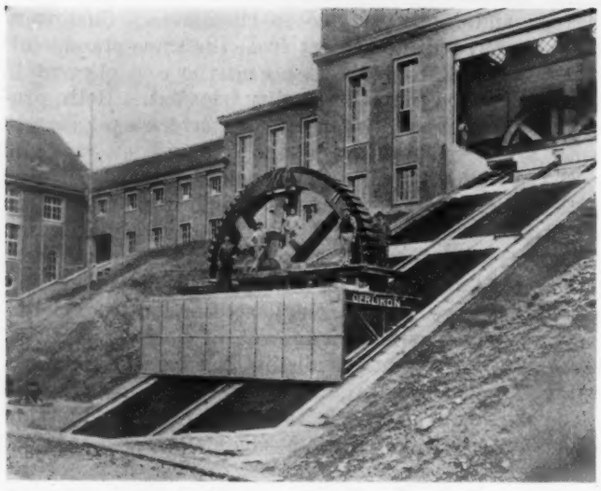
In a study of the costs of low power factor and the costs of correction engineers are called upon to evaluate the cost of redesigning, reconstructing or purchasing equipment for correcting power factor on the system of the utility company and to weigh the cost of delivering service at low power factor in comparison with the cost of delivering service at high power factor. In addition, they must determine the costs involved and the effectiveness of different methods of correction applied to the different parts of the utility system. Following these studies, executive decisions must be made in regard to the apportionment of costs to the utility and to its consumers and the formulation of a rate affording a financial inducement for customers to institute correction. Cost analyses, however, should not be used in attempts to fix power-factor rates on a "cost of service" basis.

Were it not that low power factor represents one of the big economic wastes in the electrical industry, the complexity and the difficulty of doing the work necessary to arrive at a businesslike corrective scheme for each property would warrant its neglect. Experience shows, however, that the job can be done and that power-factor correction can be made a profitable part of the business activities of both the utilities and their customers.

Eglisau on the Rhine

A Plant on an International Stream

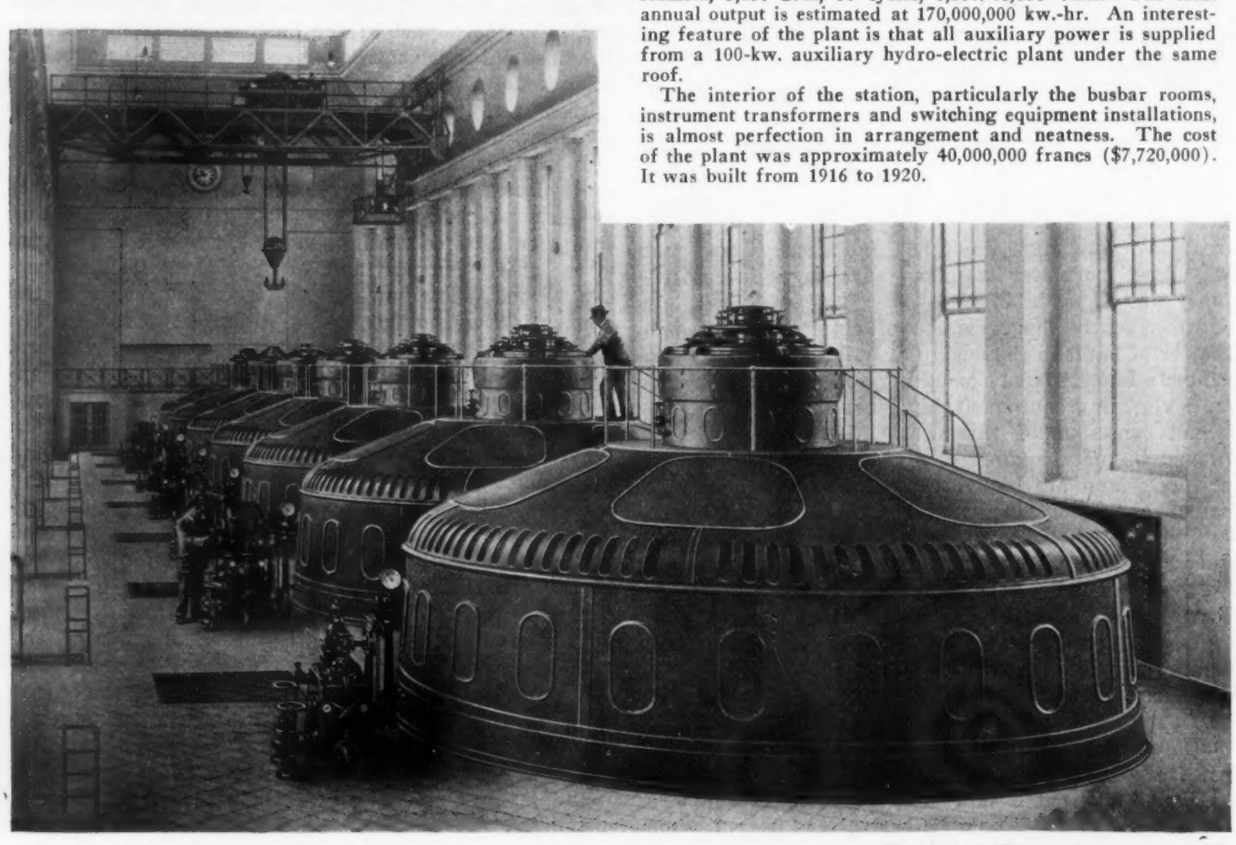




ONE of the most picturesque European hydro-electric stations is this 42,000-hp. brick-red plant at Eglisau, Switzerland, with its green background and surroundings. It stands just below the town of Eglisau on the Rhine, which is at that point the international German-Swiss boundary. The plant is owned by the "Nordostschweizerische Kraftwerke" (N.O.K.), whose entire 70,000,000 francs ($13,510,000) of share capital is held by the governments or state-owned electricity works of the following cantons: Aargan, Glaris, Zurich, Thurgau, Schaffhouse and Zoug. The energy produced is divided between Canton Zurich (64 per cent), Canton Schaffhouse (27 per cent) and the former Grand Duchy of Baden, in Germany (9 per cent).

Physical data on the plant follow: Seven vertical-shaft Francis turbines, maximum output 6,000 hp. each, head 8.25 m. to 10.97 m. (27 ft. to 33.5 ft.), water utilized 115 cu.m to 350 cu.m per second (4,070 cu.ft. to 12,370 cu.ft. per second); seven Oerlikon three-phase alternators, 5,150/5,500 kva., at 8,500 volts, 50 cycles, 83.4 r.p.m.; seven three-phase transformers, 5,150 kva., 50 cycles, 8,000/48,600 volts. The total annual output is estimated at 170,000,000 kw.-hr. An interesting feature of the plant is that all auxiliary power is supplied from a 100-kw. auxiliary hydro-electric plant under the same roof.

The interior of the station, particularly the busbar rooms, instrument transformers and switching equipment installations, is almost perfection in arrangement and neatness. The cost of the plant was approximately 40,000,000 francs ($7,720,000). It was built from 1916 to 1920.

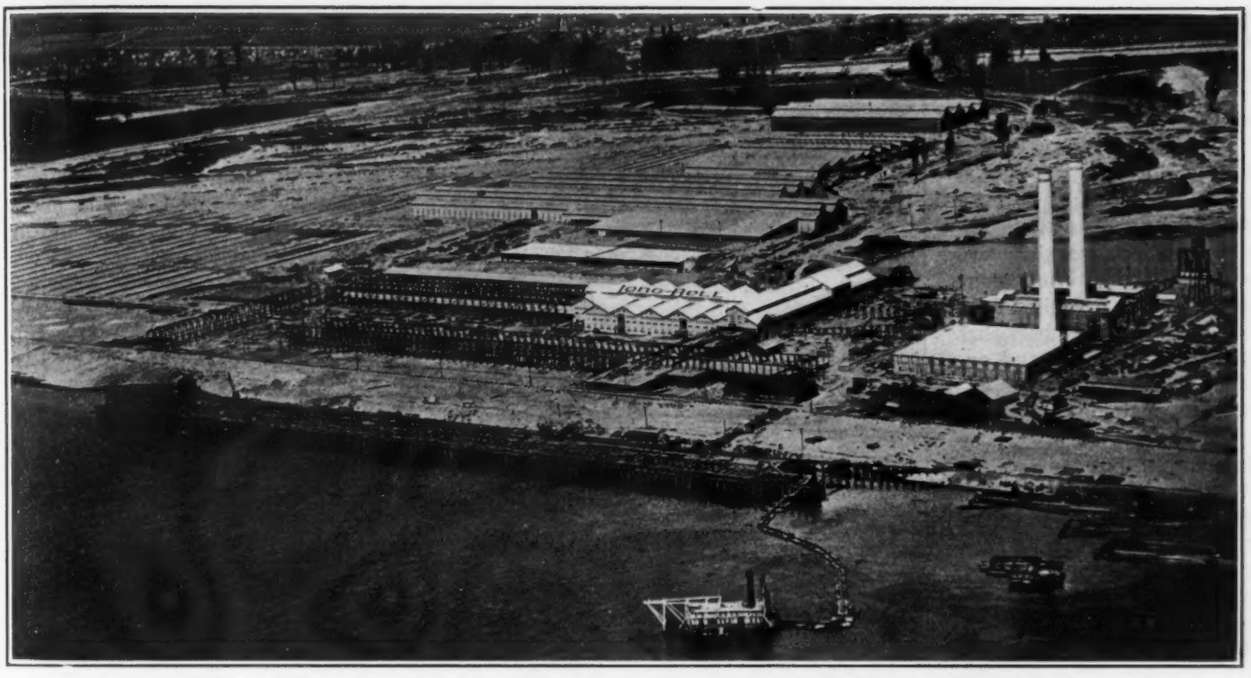


Electricity in a Modern Lumber Project

I—General Plan

Completely Electrified Plant and Logging Operations Require 18,000-Kw. Power Installation—First Mill Unit Cuts Half Million Board-Feet per Shift—New City Is Built

By FRANK R. INNES
Sessions Engineering Company, Chicago, Ill.



AIR VIEW OF FIRST UNIT OF LONG-BELL LUMBER COMPANY'S MILL AT LONGVIEW, WASH.

The view shows the new city of Longview in the background. Both mill and woods operations are entirely electrical. Three 6,000-kw. turbo-generators supply electrical energy for the entire project. The ultimate development calls for a duplicate mill and power plant and the expenditure of upward of $60,000,000. This will include the entire Longview development.

TO BUILD a new modern city, an electrically operated saw mill with a capacity of 450,000 board-feet per eight-hour day and an 18,000-kw. power plant where less than two years ago there was nothing but marshes seems a herculean task, but none the less this is what has been accomplished by the Long-Bell Lumber Company.* The mill and the new city of Longview, Wash., are situated in southwestern Washington at the junction of the Cowlitz and Columbia Rivers, and the timber is cut from a large tract which centers about 30 miles north of the city. The logs are brought down to the mills on a steam railroad which will be electrified later.

General Project Only Half Completed

This will be the first of a series of articles describing the application of electricity to this project, and in the interest of coherence between this and succeeding articles it is not amiss to insert here a few words concerning the general project.

The mill as at present constructed comprises about one-half of the project undertaking. The complete plant, as now anticipated, will include two main units for the production of fir lumber in finished form, cedar and hemlock mills, shingle factory, sash and door plant, veneer factory and other small production units. The first (west side) fir mill is now in operation, and it is with this that the series of articles is concerned. This unit is designed for a capacity of 450,000 board-feet per eight-hour day.

Although the singular form of the word is used, the west side "mill" includes about twenty buildings exclusive of the power house and temporary structures. These are the head mill, in which the logs are cut into cants which are either squared directly and sold as timber or transferred to the remanufacturing plant, where they are sawed into standard lumber sizes. From the remanufacturing plant part of the lumber passes through the yard sorters, where it is sorted and graded for air seasoning in the yard; the rest goes through the drop sorter, which sorts it according to length, and on to the stackers, where it is piled on cars ready for the dry kilns. From the kilns, through the cooling shed, the

*In an earlier article (ELECTRICAL WORLD, April 26, 1924, page 818) Mr. Innes described the "floating power house" which was built as a construction power plant to help hasten the general construction at Longview.—EDITOR.

lumber passes, undergoes another grading inspection in the dry sorters, and is transferred to the rough storage sheds, where it remains until orders from the planing mill draw it out. From the planing mill the finished lumber goes to the storage and loading sheds, where it is loaded on cars and is soon on its way to help relieve the housing situation. The wood refuse from the mills, consisting of sawdust, shavings and the "hogged" short cuttings, is transported by means of conveyors and blower lines to the fuel storage house and from there as required to the furnaces of the power house. From this synopsis it may be appreciated that a lumber "mill," in the sense of this article, is a wide-flung and intricate manufacturing plant.

Supplying the raw material—logs—for a mill which cuts nearly a half million board feet every eight hours is a big job. When that mill is multiplied by four—two mills in the complete project working two shifts—getting out logs becomes a really big job, a job to demand the best that modern machinery and engineering skill can give—an electrical job.

Logging with electricity is not new, but its development has been slow for two reasons inherent in the character of the load. Logging requires two machines which are often combined into one set-up. These are the yarder and the loader. The yarder brings the logs into the clearing from the surrounding terrain and the loader deposits them on the railroad cars. The felled tree is cut into logs ranging from 16 ft. to 64 ft. long as it lies on the ground. The yarder is at the base of a tall tree which has been trimmed of its branches and carries instead a complex arrangement of pulleys and guys. This is the spar tree. Through a 3-ft. sheave at the top of the spar a steel cable $1\frac{3}{4}$ in. in diameter runs from the drum of the yarder to the logs a thousand feet or more away in the woods. At the end of the yarding line are slings equipped with choker hooks, and into these one or more logs are lashed. Then the yarder begins hauling in the line and the logs are on their way. They come bumping and leaping as they are snaked across the rough and stump-covered ground. As the logs encounter obstructions and clear them in triumphant jumps, the yarding line is taut as a piano string one instant and slagging the next. Dragging a log, or logs, the weight of which is measured in tons, through stumps and entangling brush and over rough ground is a formidable load to impose on any machine. At the base of the spar tree is a boom from which depend tongs that pick up the logs and place them on the car which is on a track alongside. The loader is not such a spectacular performer as the yarder, but it has work to do that demands a high torque drive as well.

The two reasons for the slowness of the development of electrical power application to logging operations are apparent. The first is that the steam engine was much more satisfactory in handling such violent loads than any motor heretofore available, and the second is that average power supply companies, particularly in sparsely settled country, have systems which cannot withstand the imposition of such a fluctuating load on their lines. Motor improvements in the past few years have pretty well disposed of the first objection, and the second, in the present case, is eliminated by the diversity factor obtained by the use of a number of machines at the same time and by the fact that this lumber company is furnishing its own power. The power house, a plant of 18,000 kw. present capacity and 36,000 kw. ultimate rating, is located on the mill site and furnishes energy to the mill, the town of Longview and the logging operations.

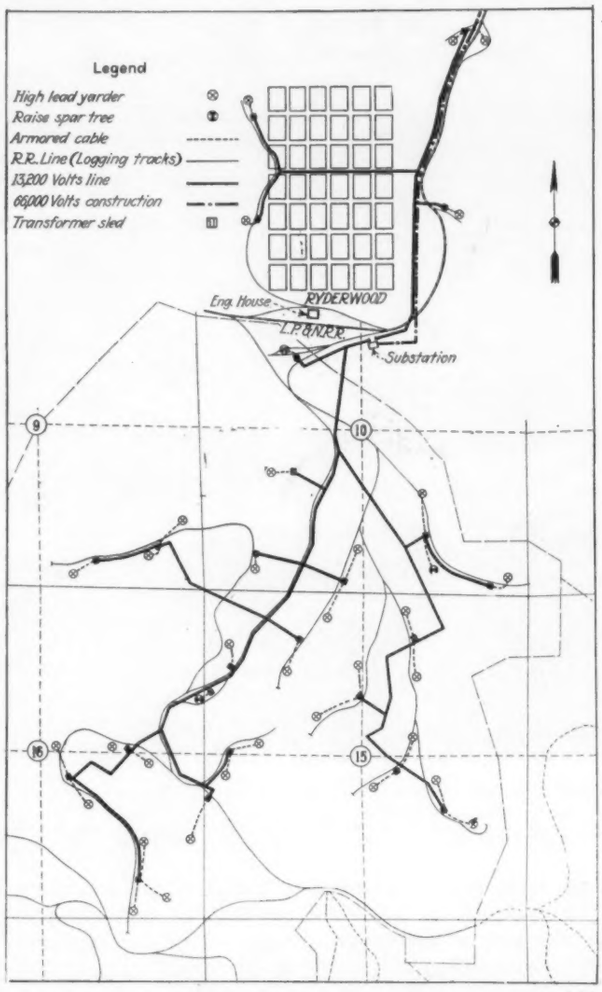


FIG. 1—WOODS DISTRIBUTION SYSTEM OPERATING AT 13,200 VOLTS ON LONG-BELL PROJECT

The transmission line to the woods is fed at 66,000 volts from three 2,000-kva., single - phase, delta - connected transformers at the main substation in Longview. The transformer low tension pressure is 13,200 volts, which is the generating potential of the power house. The line is of No. 2/0 bare copper cable strung on 50-ft. untreated Western red-cedar poles with pin-type insulators on all straightaway sections. At Ryderwood, about 30 miles from Longview, which will be for some years the center of the woods operations, the transmission voltage is stepped down to 13,200, the woods distribution pressure. The Ryderwood substation is so designed that it may be easily disassembled and transported to a new logging center when the present cut is exhausted. It is outdoor type, of steel-frame construction and contains three 1,500-kva. transformers feeding a secondary bus arranged with six positions for outgoing lines. The incoming line is connected to the transformers through three single-pole disconnecting switches which are operated as a unit by a rod from the ground. There is no oil breaker at this point because the transmission line feeds no other service; the Longview station oil switch furnishes adequate system protection, and the 66,000-volt disconnecting switches will break the trans-

UNLOADING ONE OF THE SLED-TYPE SUBSTATIONS IN THE WOODS

former magnetizing current if it is desired to cut the substation off the hot line. An oxide-film lightning arrester is connected to the load side of the disconnecting switches. The feeder positions on the secondary bus are equipped with disconnecting switches and individual tank per pole, 400-amp., 15,000-volt oil circuit breakers with trip coils.

The feeder lines from the Ryderwood substation (see Fig. 1) radiate through the woods to portable substations in the logging areas where the line potential is stepped down to an operating pressure of 600 volts. Except where open spaces make them necessary, no poles are set in the woods, the lines being carried on special cross-arms fitted with chain clamps (see Fig. 2) which are fixed to convenient trees, as shown in one of the accompanying illustrations. When a portable substation is moved to a new working area the line feeding it is extended or moved as the case requires. The chain clamp arms, which are handled with the insulators in place, greatly facilitate such changes in the line. The insulators are of the suspension type. The use of

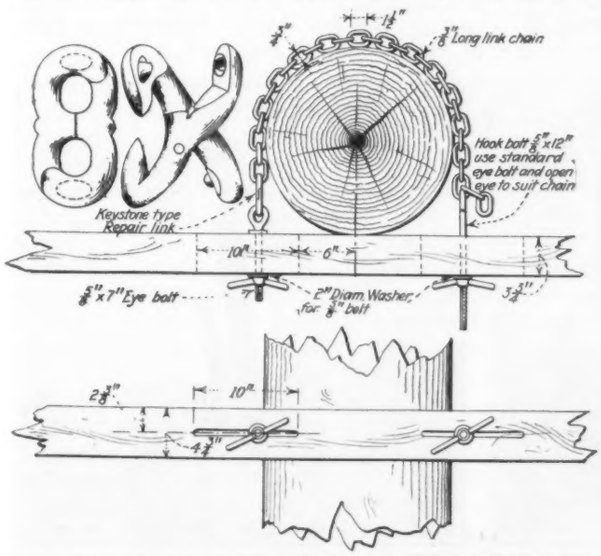

3/8" Long link chain
Hook bolt 5/8" x 12" use standard eye bolt and open eye to suit chain
Keystone type Repair link
10"
6"
5/8" x 7" Eye bolt
2" Diam. Washer for 5/8" bolt
10"

FIG. 2—DETAIL OF TREE ATTACHMENT FOR CROSS-ARM ON 13,200-VOLT WOODS DISTRIBUTION LINES

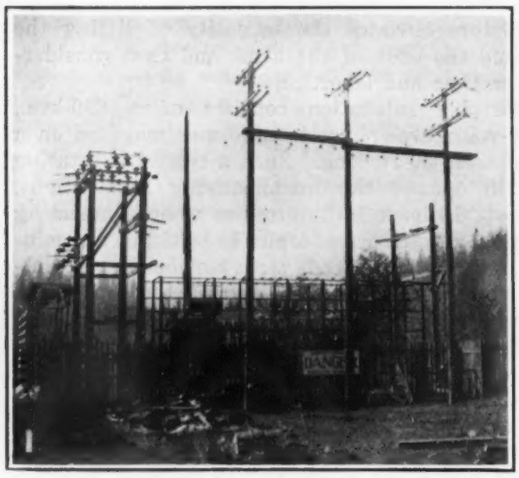
these insulators obviates the necessity of lifting the wires around the ends of the arms and thus considerably reduces time and labor.

Each portable substation consists of a 600-kva., 13,200/600-volt, three-phase transformer mounted on a pair of log skids 30 ft. long. Such a typical substation is shown in one of the accompanying illustrations. There are six 16-in. x 16-in. cross-members connecting the two skids, and the transformer is bolted on the middle pair. Four ¾-in. tie rods with turnbuckles are attached at points spaced 90 deg. around the top of the transformer and run at about a 45-deg. angle to the skids. The upper framing of the sled is composed of 6-in. x 6-in. timbers, on which is mounted the auxiliary apparatus. The line enters the transformers through a three-tank oil breaker. Before entering the breaker the energy passes through a set of choke coils on the line side of which are a set of compression chamber lightning arresters. The secondary is connected to a knife switch arranged with a fused double branch, the whole inclosed in a metal cabinet. The branches terminate in cable terminals projecting from the back of the cabinet. An integrating wattmeter is connected in the secondary. The wattmeter set-up is so arranged that a recording instrument may be substituted for the integrating meter if it is desired to obtain graphic records. Since it is anticipated that the portable stations will receive scant consideration in the matter of careful handling, the whole set-up is made as rugged as possible so that in loading on cars and dumping off at a new set-up there will be no damage to equipment.

PORTABLE SERVICE CABLES

The cable which serves the logging machines is worthy of mention. It consists of three 250,000-circ.mil rubber-covered conductors laid with tarred jute fillers, the bunch wrapped with four layers of varnished cambric tape and one layer of half-lapped rubber-filled tape, the whole inclosed in a galvanized-steel wire armor wound with a 5-in. pitch. The short pitch of the armor and the absence of lead make the cable very flexible and easy to handle. In service the cables are laid on the ground, and they must withstand the rough treatment natural in such location, frequent immersion in water and all the vicissitudes of things underfoot. The cable is supplied in lengths of 500 ft. and 250 ft., each end fitted with a waterproof coupling so that connection may be readily made with another cable length, to a transformer sled or to one of the logging machines used in the operations. It is intended that the maximum transmission distance between transformer sled and logging machine shall be 1,000 ft., and the average run will probably be no more than 500 ft., the length of the longest section of cable.

The present logging equipment at Ryderwood consists of six combination yarders and loaders and two single yarders (see illustrations). These eight machines represent two different ideas in the application of electrical energy to logging operations. One makes use of a two-speed motor and the other effects speed changes by means of clutches and gears. Three combination machines and one single yarder of the first-mentioned type were furnished by the Washington Iron Works of Seattle, and the remaining four machines, of the second type, were built by the Willamette Iron & Steel Company of Portland. The combination machines of both types are mounted on railway cars and are blocked up with timbers when in use. The single yard-



No. 1. Ryderwood substation stepping down from 66,000 volts to 13,200 volts for distribution to logging operations.

No. 2. Typical 13,200-volt line construction through woods; trees are used almost entirely for supporting the line.

No. 3. Sled-type substation with one 600-kva., three-phase transformer, 13,200/440 volts, for yarders and loaders.

ELECTRIC POWER WAS SUPPLIED UNDER DIFFICULTIES FOR WOODS OPERATIONS

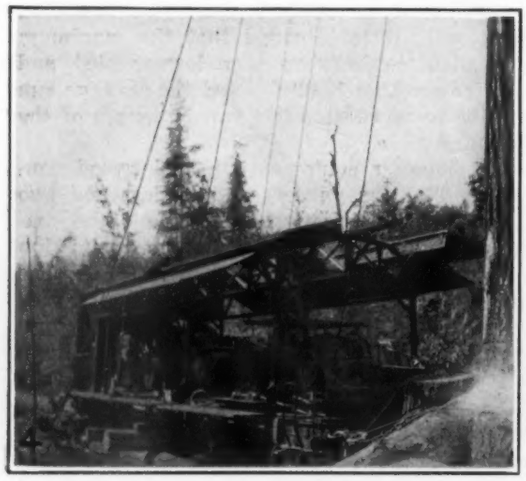
ers are set on log skids in the same manner as the portable substations so that they may drag themselves into places inaccessible to a car-mounted machine.

The equipment of a Willamette combination rig consists of one 300-hp., 450-r.p.m. yarder motor, one 200-hp., 600-r.p.m. loader motor and one 35-hp., 600-r.p.m. boom-swinging motor. All of these motors are rated at 550 volts and are of the slip-ring type. Power is transmitted to the cable drums through pneumatic clutches. The yarder motor is equipped with speed-changing gears, air-operated, which permit the operation of the yarder at two speeds as the exigencies of the work require. Each motor shaft is extended to carry a solenoid-operated brake. All motor controls are of the solenoid-contactor type. All motors are required to be capable of developing a maximum running torque equal to 400 per cent of full-load torque. On the control panel for the yarder motor are mounted main-line brake and undervoltage contactors, gravity reset inverse-time-limit overload and current-limit relays, and main line and control switches. The control panels for the other motors are similar. The Willamette single yarder has the same equipment as the combination machines minus the loading elements.

Another distinction between the two types of logging machines is that the Washington set-up makes use of pneumatically operated instead of solenoid-operated contactors for the motor controls. As before stated, the Washington machine uses a two-speed motor in place of change gears on the yarder motor. This motor is a 300/200-hp. machine operating on twenty-four and twelve poles. The loader motor is 250 hp. and the boom-swinging motor 50 hp. The pneumatic motor controls are operated by a direct current of 35 volts furnished from a 1-kw. motor-generator set.

In addition to the machines already delivered, each of the two companies, Washington and Willamette, are furnishing a super-logging machine, termed a "skidder." The Willamette skidder will have a yarder motor of 450 hp., a loader motor and a utility motor each of 200 hp. and a boom-swinging motor of 35 hp. The Washington skidder will have a 300-hp. yarder motor, 250-hp. loader and utility motors and a 50-hp. boom-swinging motor. Both skidders will be mounted on railway cars and will be for use in locations where the contour of the ground makes uphill logging necessary.

The logging machines above described compose only a small part of the ultimate woods operations. The transmission line and substation installations are designed to supply power readily to twenty such equipments, or "sides" as they are called. Twenty-four sides may be served except on very hot days.



No. 4. Yarder and loader of the Washington type with two-speed motor.

No. 5. Yarder and loader showing spar tree carrying the drag line from the woods.

No. 6. Three logs at the end of the haul from the woods.

ELECTRICAL APPLICATIONS IN HAULING AND YARDING

The "Electrical Froth" Problem

Interview with

Arthur Wright of England

Inventor and Engineer

Power-Factor Correction Is a Business and Not a Precision Measurement—Modern Rates and Measurements Too Complicated—Advocates Ampere-Hour Metering to Secure Correction for Small Power Users

"RATE clauses and metering methods have always been interesting to me, and I have been particularly interested in watching their development and application to power-factor correction. I really think, however, that present rate systems and metering methods are too precise and too scientific to be effective or to be advisable in the utility business. In particular, I disagree with the type of rate clauses and metering methods adopted for power-factor correction by most utility companies."

These remarks by Arthur Wright, noted inventor and consulting engineer, on his recent visit to this country were made to a representative of the ELECTRICAL WORLD who sought his views on power-factor rates and metering methods. Mr. Wright has had a long and intimate experience with developments in the electrical industry, and today at eighty-two the noted pioneer possesses a keenness of thought, an enthusiasm, a perspective and a breadth of vision which time has ripened and mellowed. His judgment on these subjects should be sound and his opinions authoritative. Mr. Wright continued:

"A perusal of some of the recent schedules of rates, especially those dealing with power factor, will convince many that the time has arrived for us to come back to earth again and to realize where this so-called scientific rate making is leading us.

"If in the early days of alternating-current motors the rate for this class of consumers had been studied, it could have been very easily and finally solved by insisting on the demand being measured in kilovolt-amperes and the energy in kilowatt-hours. Thus the question of power factor need never have arisen; in fact, the whole trouble has been self-inflicted by our having approached the problem from an entirely artificial point of view.

"When it is realized that practically the whole of the generating and distribution investment is bought on a kva. basis (the steam-producing equipment being the exception) and that nearly 80 per cent of the total charges against revenue in an average utility company are independent of the actual kilowatt-hours turned out from it, it is interesting to inquire how the mistake of selling service on a kilowatt-hour basis arose.

FALSE ANALOGY WITH GAS

"Probably the chief reasons were the imagined similitude of electric service to gas service, where a large bulk of the cost was in some vague way proportioned to the quantity taken, owing to the economic possibility of gas shortage and a twenty-four-hour load in the gas generators. Again, owing to the great superiority of the Thomson-Houston watt-hour meter over the older ampere-hour meters (such as the Schallenberg and others), the watt-hour basis took the field in theory and practice for the only market then existing—electric lighting. The wonderful simplicity and accuracy of the Thomson-Houston meter with its intrinsic allowance for voltage fluctuations inculcated the idea in the United States that watt-hours should be measured and not that ampere-hours should be measured and then multiplied by the supply voltage. In Europe this necessity of volt measurement was never very pronounced, and ampere-hour meters are still very extensively used for direct-current supply systems. Again, in these early days it was thought the charges for the service should and could be made nearly proportionate to the supposed cost of generation and distribution of the energy, and, as the whole business was then electric lighting, the energy consumed was proportional to the current multiplied by the supply voltage and thus the kilowatt-hour basis was firmly established before the alternating-current induction motor appeared on the scene.

"Soon after its arrival in commercial practice, however, early in this century it was noticed that the kva.-hours supplied were out of proportion to the kilowatt-hours absorbed by the motor, so that in order to carry out the mistaken notion of equitable rates for the energy actually of value to the consumer, it was thought the bill should be based on the kilowatt-hours registered independent of the kva.-hours supplied. Here again an entirely wrong method of rates was firmly established by a belief in the possibility of a real equity in energy charges, with the result that the Hopkinson basis of investment demand was seriously departed from.

"About 1904 it was pointed out that the practical way of meeting the induction-motor supply difficulty was to measure demand in kva. and the energy in kilowatt-hours by an instrument then available. However, by this time the illusion that a consumer's bills should be roughly proportionate to the usefulness of the electricity to him, and that the cost of the service was also roughly proportionate to the use, was too firmly established to permit of the kva. demand proposition being listened to, particularly as the induction-motor nuisance had not attained serious dimensions and the task of explaining to the public and the public service commissioners the difference between kva.-hours and kilowatt-hours appeared to be hopeless.

"About 1915 the disastrous effect of charging entirely on the kilowatt-hour basis began to be appreciated by many in America, notwithstanding that most of the engineers' attention was entirely devoted to the prob-

lem of meeting the rapidly increasing demand for electricity. About this time Watkins of the Boston Edison company, in order to get over the consumers' difficulty in understanding power factor, made the happy suggestion that the people should be told that low power factor was equivalent to the pumping and conveying of frothy water and that induction motors, especially when underloaded, as they generally are, had the effect of producing an equivalent to froth in the electricity supplied them and that this 'froth,' while not so effective for driving the consumer's machinery, required just as much generating and distributing capacity as the more solid electricity, exactly as frothy water requires as many and as large pumps and conveying pipes as pure water.

DIFFICULTY OF CONVINCING

"Thus an easy explanation was arrived at, but the full measure of the wasted investment caused by 'froth' electricity has only recently become appreciated by the utility engineers, and hardly any of the state commissions have been convinced of the necessity in the public interest to sanction a charge for low power factor. This is the position today, and the terrible waste of investment, the useless loading up and heating of the conductors and the consequent bad regulation have become in many places intolerable.

"Unfortunately most of the utility rate makers are now trying to correct their rate errors of the past by devising ultra-scientific additions to their rate schedules, which, while confessedly unintelligible to prospective consumers, are supposed to be equitable enough to be approved by the state commissions, and, in addition, very beautiful modifications of the metering appliance have recently appeared which unfortunately may still further lead the commissioners to think that equity in electrical rates is quite possible of attainment.

"Now, is it not time to acknowledge that this fetish of equitable charges is not only unobtainable but has never been really practiced, Hopkinson notwithstanding? For instance, I may mention as accepted or proposed methods entirely inconsistent with the idea of equity the practice or ignoring distance from stations and the necessity of averaging rates for classes of consumers, the recent talk of supplying farmers at the city rates, the charging of street lighting on a rate governed by political considerations, the curious uncertainty as to at what rate the reactive kw. should be made, the rate at which peak supply should be given, what should be the basis of charging for such service as spot welding, which registers neither any appreciable kilowatt-hours nor even any kw. of demand, owing to its short and intermittent nature, and many other services where the Doherty service charge is the only applicable one.

RATE-MAKING IDEAS

"I would suggest that we should have in view the following ideas in rate making:

"1. Make the annual cost to the motor consumer, if possible, in proportion to the investment and service necessary for his supply and use a meter charge to check unnecessary capacity, if this is unascertainable, in proportion to his kva. demand and his kilowatt-hour consumption.

"2. In the case of small induction-motor users charge by the kva.-hours consumed so as to compel them to put in static condensers or synchronous corrective apparatus; heating and cooling would be unaffected.

"I am aware that this radical charge to ampere-hour measurements will be very difficult because of the many cut-and-try rates at present in force, but the serious nature of the low-power-factor conditions existing warrants some vigorous remedy.

"I trust no one will bring up the difficulty of getting ampere-hour meters, or the necessity of having kva. meters, or the trouble of getting polyphase ampere-hour meters to give accurate results on unbalanced circuits, as this will show an imperfect sense of proportion and imperfect comprehension of the serious nature of the problem.

"Good enough ampere-hour meters were in use long before kilowatt-hour meters, charging by actual ampere-hours, and there is no use in perpetuating the impression that we are all trying to charge in proportion to the use of the consumer, which we cannot in any sense do. Don't let us fool ourselves any longer on this problem.

"Ask the manufacturers to produce a simple ampere-hour meter with a demand-meter attachment for larger consumers. Apply the new rate instead of adding any more academic clauses which will have the same fate as many attempts have met today, viz., inapplicability to actual conditions or to actual working.

"The fact that most of the utility business is for power purposes accents the necessity of a general propaganda on this ampere-hour proposition in order to prevent the induction-motor installation becoming an intolerable nuisance, and it is of far greater importance than many imagine. It is time the multitudinous scientific cobwebs were brushed aside and a plain ampere-hour basis insisted upon for motor supply. The real difficulty I see is that it is much easier to invent more scientific self-fooling tariffs than to confess that a much simpler and more equitable method has existed from the very start.

"The meter manufacturers and the utilities will not very quickly put in the necessary meters because naturally they will have to look after their own interests and not change their investments too suddenly. It will take a long time also to convince the state commissions that all past attempts to devise equitable tariffs have been on utterly unsound lines and that the ampere-hour method is fairer in the end to the public than the kilowatt-hour method. Yet the problem is too serious to permit of our studying individual interests or reputations, and it is time for us to consider how and how soon the campaign can be started and carried on. The difficulties in the way should not prevent a realization of how really dangerous our present blindness is becoming or tempt us to stick to our old shibboleths on rate making.

"The marvelous extension of today's electrical business should be no excuse for saying that present methods of power-factor billing are good enough, as any investigation of the enormous amount of idle investment and poor service caused by low-power-factor business, if brought to the notice of executives and commissions, would aid in obtaining permission to remedy the evil.

"Apart from the financial losses involved in our present methods, the multiplicity of wholly unworkable and incomprehensible tariffs and unnecessarily expensive meters warrants a vigorous shake-up."

Stability of Long Transmission Lines

Depends on Speed with Which Reactive Kva. Can Be Added to System —Illustrative Problems and Data Necessary to Determine Stability Limits—General Solution Offered

By C. D. GIBBS
Dwight P. Robinson & Company, New York

BRIEFLY, the stability of a long transmission line with an increase of load depends on the speed with which reactive kva. can be added to the light and power system. If the correct amount of reactive kva. necessary to restore normal voltage for the new load condition could be added with sufficient speed there would be no change in voltage and the line would be stable up to its ultimate limit of capacity. If this could be attained, it would make no difference if the load were applied gradually or in one lump—the limit would be the limiting capacity of the line. The problem of stability then becomes one of adding reactive kva. with sufficient speed to neutralize the voltage drop produced by the increasing kw. load. Since kw. can be added nearly instantly by closing or opening a switch, it becomes necessary to add reactive kva. with the same speed and in synchronism with the change of load. This is manifestly impossible. The voltage therefore must drop, but the amount of drop and the time it exists are under the joint control of the designer of the system and the designer of the equipment.

Fig. 1 shows the characteristic curves of a line and synchronous condenser based on a pure resistance load, a condenser of zero inertia and constant voltage at the generating end. These are ideal conditions, but the deviations from this as imposed by actual conditions will be considered later. The condenser excitation curves are obtained by using the synchronous impedance of the machine and therefore represent the steady operation.

Consider the system operating at normal receiving voltage and carrying 100 per cent load. This condition is shown by point *A*. The condenser for this load is merely floating on the line, the steady condition for 125 per cent load being represented by *B*. The load can pass 100 to 125 per cent without change of voltage provided the change from 100 to 170 per cent of the excitation can keep pace with it—that is, 22,000 reactive kva. be added in the same time that the load increases 25 per cent. Line *AB* is the path traced by the voltage under these conditions. If no change is made in the excitation, the new load can be carried at 84 per cent voltage, as shown by the intersection of the curves at point *C*. The line *AC* does not represent the path traced during the drop in voltage since it implies a transient reactance equal to the synchronous reactance, the actual path being some such curve as curve 1. The path *CB* represents the voltage recovery when the change in excitation is made slowly.

Path *AB* represents perfect regulation, and *ACB*, by path 1, hand regulation. Between these two lie curves of automatic regulation of various speeds. One such curve of automatic regulation is shown as curve 2. The minimum voltage point of this curve depends upon the speed with which the excitation is changed. By accelerating the change in excitation this minimum point is raised, as is also the overshoot in voltage as indicated by point *D*. The voltage then oscillates along *DBC*, coming to final rest at point *B*.

In the case just given there is no particular advantage in raising this minimum point as far as stability is concerned, but if the load had been increased 30 per cent, the line would have been unable to deliver the power (100 per cent excitation curve does not intersect the 130 per cent load curve) without a change

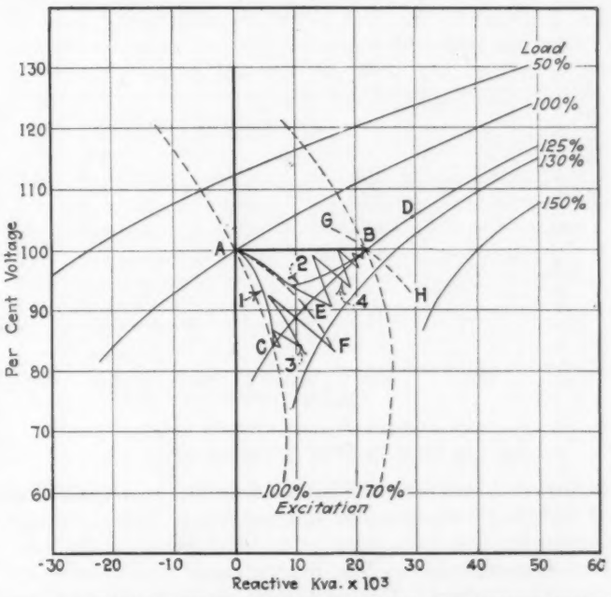


FIG. 1—CHARACTERISTIC CURVES OF A LINE AND SYNCHRONOUS CONDENSER, BASED ON A PURE RESISTANCE LOAD, A CONDENSER WITH NO INERTIA AND CONSTANT VOLTAGE AT GENERATOR END

in excitation. The line, therefore, is unstable for hand operation and may or may not be with automatic regulation. There are two cases in which stable operation may be attained—first, when the regulator changes the field with such rapidity that the voltage is at no time insufficient to maintain synchronism, and, second, when the regulator does permit the voltage to drop below that necessary for synchronism for a very short period of time. In the latter case there will be an interval when the machines are drifting out of step, but if the voltage is restored soon enough—particularly with an overshoot—the machines may be drawn back into step. In a line where the stability cannot be obtained by hand regulation it is necessary to resort to some method by which the addition of reactive kva. can be accelerated. Methods for accomplishing this will be considered later.

The assumptions for the curves in Fig. 1 are:

A. Condenser excitation curves based on synchronous impedance.

B. Power factor of load constant at unity.

C. No generating capacity (inertia or otherwise) at the receiving end of the line.

D. Sending-end voltage maintained constant.

The results obtained are modified by the actual deviation from the above assumptions. For example:

A. The synchronous impedance is obviously too severe a condition by which to determine the stability, but if transient reactance is used for the initial value, then Fig. 1 must also be plotted against time, making a three-dimensional figure. Only one time is of interest, and that is the time required for load to change—in this case to increase from 100 per cent to 125 per cent. Curve *AE* represents the voltage change on this basis with the voltage at 90 per cent of its original value instead of 84 per cent as given by the synchronous impedance curve.

B. Only a theoretical load will have unity power

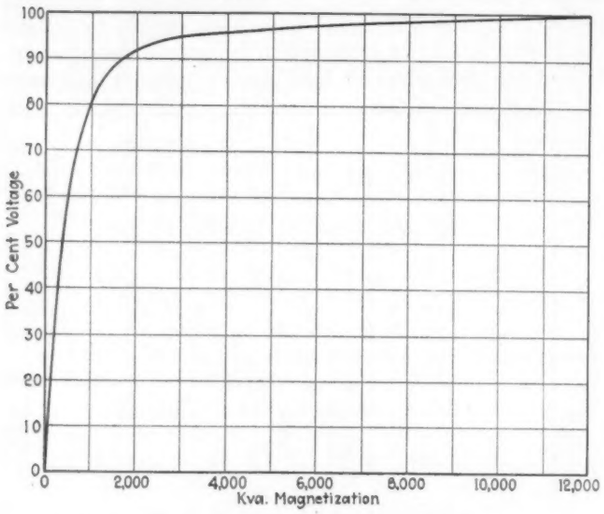


FIG. 2—TRANSFORMER MAGNETIZATION CHARACTERISTIC AFFECTS LINE PERFORMANCE

factor with variable voltage. Actual loads, consisting of lighting, synchronous and induction motors, rotary converters and the necessary transformers and distribution system, require less magnetizing kva. with a decrease in voltage. The necessary reactive kva. required by the line during the period of falling voltage is furnished in part by the load, and the remainder must be furnished by equipment for that purpose. The curve *AE* should therefore be composed of the load reactive kva. as well as that of the condenser, the actual curve being somewhere between *AB* and *AE*. The line, if stable for a load of unity power factor, must be even more stable for a load of variable power factor.

C. The inertia of the load has an important bearing on the time required for the line to assume the full increase of load. As the load increases the voltage angle over the line—that is, between load and generator—must increase. The synchronous apparatus at the receiving end of the line in adjusting itself to the new angle delivers power to the load, and this means that the line is not immediately required to transmit the full increase of the load. The time required for the line to assume the load is lengthened, and also the maximum load to be transmitted is increased by the overswing of the machines. Though the increase of load is not desirable, yet the delay gives the regulator a chance to start boosting the fields. The overswing due to inertia is represented by point *F*, the line being called upon to transmit 135 per cent load in order that the machines may remain in step. The machines would oscillate along curve *AEF*, coming to rest at *E* if the impedance did not change to synchronous impedance and if no change were made in the excitation. The actual path with no change in excitation would appear as curve 3. *AEB* represents the mean path with no regulation, and curve 2 with automatic regulation. Superimposing the oscillation on curve 2 gives curve 4, the actual path traversed by the voltage. The voltage oscillation or the power oscillation may not have died out by the time point *B* is reached. If the regulator is insufficiently damped, the voltage will continue to oscillate along curve *EBD*, and if the synchronous machines are insufficiently damped, there will be a power oscillation along curve *GBH*. Any separation of the machines from the common terminal of the line or a difference in the periods of oscillation results in compound oscillation between all the machines concerned, the composite of which is the one affecting the line and which appears as curve 4.

The presence of generators, especially turbine-driven ones, further complicates the action. Up to point *E* they have the effect of delivering constant power to the system, but before point *B* is reached the governors have responded and the load which the line is called upon to deliver is reduced. The governor makes several swings in adjusting the steam flow to the new value of load, so there are alternate periods of surplus and deficit of power. These impulses added by the governor action may occur at the right period to add to the swings already produced in the adjustment of voltage angle and hunting results. In general, the presence of generators improves the stability if the period of governor action does not agree with the period of oscillation of the system.

D. The fourth assumption is constant voltage at the generating end. While the generating plant may be capable of restoring the normal high-tension voltage, yet it must drop during the first part of the transient period owing to the transformer and generator impedance. The line, therefore, may be considered of greater length by an amount equivalent to the transformer impedance and the generator transient impedance for the initial value. As armature reaction takes place the point of normal voltage may be considered as traveling further into the generator, that is, increasing the line length still more by the additional reactance. This inward travel of voltage is met by the increasing field, and the point of normal voltage returns to its original position. The equivalent length of line is a variable the maximum of which depends on the time required by the load to reach the minimum of curve 2, on the speed of demagnetization and the speed of increasing the field current. The effect, then, of variable generator voltage is to increase the line length during the first part of the transient and to decrease it to normal during the second part. The line characteristic curves must therefore be plotted on this basis.

General Solution

The solution of the stability problem then consists of:

1. Determining the maximum amount of power which may be thrown on the system and the time required.

2. Determining the proportion of this to be carried by the line and the time required.

3. Plotting the load characteristics on the basis of transient impedance for synchronous apparatus at the initial value.

4. Plotting the line characteristics on the basis of changing length, the initial value being fixed by the transient impedance.

5. If the transition curve (4) in Fig. 1 shows sufficient voltage to maintain synchronism at the maximum swing of phase, then the line is stable.

6. If 5 shows the line unstable, the shape of curve 2 must be changed so that the minimum will be raised or the amount of swing reduced, or the time the machines are out of step reduced and the voltage overshot made sufficient to draw the machines back into step.

To reduce the swing the inertia of the synchronous apparatus must be reduced and the damping increased. But small change can be made in these, and therefore any material improvement in stability must be made in accelerating the addition of reactive kva.

Several methods are available for speeding up this action, among which are:

A. Reduction of series reactance.

B. Increase of shunted capacitance.

C. Reduction of shunted inductive reactance.

A. Can be accomplished by placing series reactance in the line, which is varied by shorting out with a breaker or in changing the saturation of its core. It has the undesirable feature of being variable with load. Its action is relatively slow, being dependent on the time of operating a circuit breaker or of changing a highly inductive field.

B. This is the usual method of readjusting a condenser field, which likewise requires an excessive time. By improving the system of excitation this may be cut to about one-third or one-fourth of the time required by the present systems.

C. Shunted reactance can be disconnected by switching or varied by changing the saturation of its core. Without using separate equipment, this feature may be incorporated in the main transformers. Referring to Fig. 1 and permitting a 5 per cent drop in voltage, the condenser would supply 7,500 kva., while 16,500 kva. is required to carry the load. The difference, 9,000 kva., can be supplied by the transformer if it is designed with the saturation curve shown in Fig. 2. In this case dropping the voltage to 95 per cent reduces the magnetization required by 9,000 kva. Since the condenser is already excited for this amount, no immediate change in excitation is required and the 9,000 kva. is instantly available for the line. The use, then, of such a transformer changes the drop in voltage when a 25 per cent increase of load is thrown on from 10 per cent to 5 per cent. This method has the undesirable features of increasing the transformer loss and cost and of increasing the kva. rating of the synchronous condensers by an amount necessary to supply the excess magnetization of the transformers, which is fixed in turn by the allowable voltage drop. The increase in the condenser size may not be undesirable since the no-load lagging kva. may exceed the maximum load leading kva. and the increase in leading kva. will not increase the rating of the machine, or will secure a better working ratio between the lagging and leading kva.

Increased stability can probably be obtained more advantageously by a combination of methods than by any one method. The saturated-core transformer combined with an accelerated field system for the generators and synchronous condensers is apparently one of the most satisfactory methods of obtaining results.

Electric Heat Treating

Automobile Manufacturer Strongly Indorses It, Basing His Opinion on Long Experience—Compares It with Fuel-Fired Process—Furnace Construction, Operation, Replacement of Heating Units, Cost of Operation

By ALLEN M. PERRY
Western Editor ELECTRICAL WORLD

A LARGE automobile manufacturing company which has experimented over a considerable period with various types of fuel-fired and electric heat-treating furnaces has obtained such excellent results with the latter, viewed from a production as well as an economic basis, that it has decided to employ electric operation for all new furnaces installed and to substitute this method of operation for all fuel-fired furnaces as rapidly as it is feasible to do so.

This company's conclusions are based on experience with electric furnaces in hardening wrist pins, push rods or tappets, roller bearings, commutator rolls, drive-shaft bearing housings and front and rear spring leaves and in the bright annealing of copper wire and the electric heating of nitrate and oil-draw baths. In conducting the investigations the company has not only subjected various standard makes of fuel-fired and electric furnaces to service tests, but has made modifications therein to ascertain the best results that can be obtained. The conclusions are based on the over-all cost of operating the furnaces and on all indirect advantages or disadvantages which are properly chargeable to the method of furnace operation employed.

The investigation showed that producer-gas-fired furnaces are the most economical of the fuel-fired type, regenerative furnaces ranking next. However, with any fuel-fired furnace, it is pointed out, hand control is absolutely necessary because no automatic method has been found which will produce the desired results. Consequently, the uniformity of quality obtained in fuel-fired furnaces is much below that obtained in electric furnaces. With producer-gas furnaces the desired temperature can be maintained within plus or minus 30 deg. only 15 per cent of the time, according to service records, owing to the human element in control. On the other hand, with electric furnaces the temperature can be maintained within plus or minus 3 deg., because of the effectiveness of automatic control now obtainable. These figures are based on a treating temperature of 1,500 deg.

CHECK ON CHEMICAL ANALYSIS

The uniformity of temperature obtainable with electric furnaces is not only a great benefit in obtaining uniform quality but it makes possible a very accurate check on the chemical control of the product being

treated because of the assurance of obtaining a definite heat cycle for the product. Consequently, there is not only a reduction in the unit cost of the furnace product due to reduction of improperly treated metal, but there is a saving in the expense of preliminary and subsequent operations performed on products which would have to be scrapped because of quality. Because of the definite heat cycle assured by electrical operation, it is possible by making Brinell hardness tests on the treated product (in the case of steel) to ascertain whether the characteristics of the metal furnished to the furnace are within the limits prescribed by the chemical laboratory.

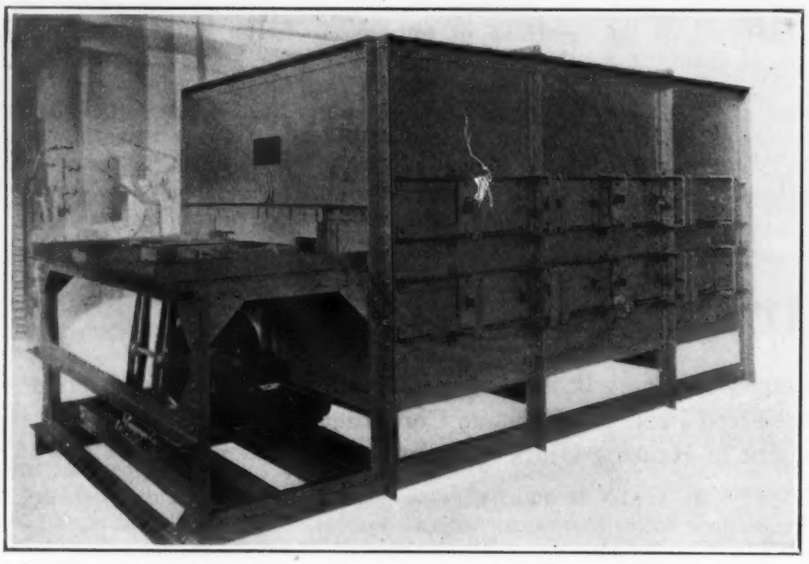
COST LESS AND ARE EASILY MOVED

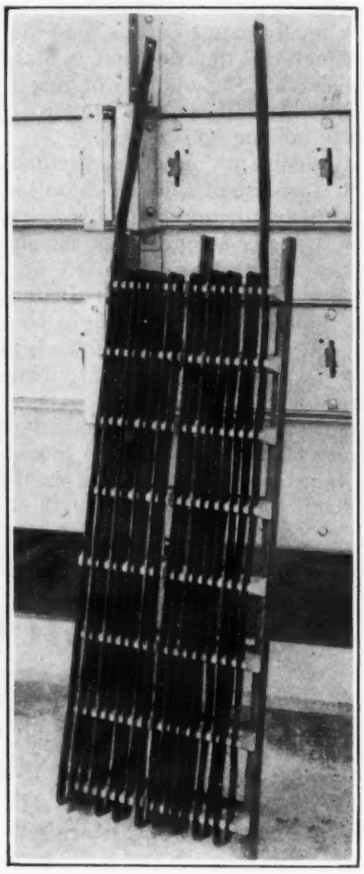
Electric furnaces also have an advantage in being lower in first cost than fuel-fired furnaces as the price of an electric furnace is the only initial cost, whereas with fuel-fired furnaces there is the investment in foundation and auxiliary equipment necessary to the combustion of fuel. Not including the investment in the producer-gas plant, it is asserted that the cost of a producer-gas-fired furnace is almost twice that of an electric furnace.

FIG. 1 (RIGHT)—TYPE OF HEATING UNIT WHICH CAN BE REPLACED IN TWENTY MINUTES

FIG. 2 (BELOW)—STEEL-CLAD PUSHER-TYPE ELECTRIC HEAT-TREATING FURNACE

This furnace has panels alongside to permit replacement of heating units. The control is placed on top of the furnace.





Fuel-fired furnaces have the disadvantage that they must have foundations which are costly to construct, limit the location of the furnace and make them costly to move. Electric furnaces can be built directly on the floor of any plant sufficiently strong to support them and in such a way that they can be moved from place to place as necessary. The furnishing of fuel and the removal of the products of combustion are problems that do not exist with the electric furnace, which is therefore not limited in its position by these conditions. This portability was taken advantage of recently by the automobile company, when one of the electric heat-treating furnaces was removed from one plant, transferred several miles, reinstalled in another plant and placed in operation, all within seventy-two hours. This, it is declared, could not have been done with a fuel-fired furnace.

Because of the fact that no foundations are needed for electric heat-treating furnaces, because connections need only be made to electric circuits, and because the temperature in close proximity to electric heat-treating furnaces can be made very comfortable, these furnaces can be put anywhere in a plant and do not have to be placed by themselves like fuel-fired furnaces. This feature is a particular advantage in that the heat treating can be done at the proper point in the chain of production without having to transfer the product from the line of production to a special heat-treating plant and then back into the line of production again, as is usually necessary with fuel-fired furnaces.

LESS LABOR WITH "ELECTRICS"

On account of the automatic control of electric furnaces, less labor is required than with fuel-fired furnaces. An example is found in the heat treatment of crank rods. With producer-gas fuel-fired furnaces such as are used in this plant at least three men would be required per furnace—two to handle stock and one to control the heat—whereas with an electric furnace only two men are required to handle stock and none to control the temperature.

In day-in-day-out thermal efficiency the electric furnace has a considerable advantage over the fuel-fired furnaces. From very careful and accurate measurements, the maximum efficiency which has been obtained with producer-gas-fired furnaces in this plant is 55 per cent, whereas that with electric heat-treating furnaces is 86 per cent under operating conditions.

According to data collected for a considerable period, about 12 lb. of steel can be heat-treated with 1 kw.-hr. Considering the cost of heat energy alone, the gas furnace may be cheaper than the electric furnace even when electricity is purchased at 1 cent per kilowatt-hour; but, considering all of the advantages previously mentioned and others which have been found in this large automobile manufacturing company's plants, electric heat-treating furnaces can easily compete with

producer-gas furnaces using 150-B.t.u. to 160-B.t.u. gas at 15 cents per 1,000 cu.ft. when electricity costs 1½ cents per kilowatt-hour.

Construction of Electric Furnaces

The electric furnaces with which the automobile manufacturing company is best satisfied have been built according to special specifications by Holcroft & Company, Detroit. The wall construction consists of 4½ in. of firebrick and 12 in. of "Silocel" or infusorial earth covered with ¼-in. steel plate. Two reasons have determined this construction—first, the furnace temperature at no time exceeds 1,800 deg. F., and second, the company is desirous of cutting down the radiation losses to a minimum both for economy and to insure comfortable working conditions for the operators. With this construction the company does not obtain a maximum furnace-case temperature exceeding 100 deg. F. The firebrick, insulation, etc., in one of the first electric furnaces of the type has been in continuous service for approximately four years, which the automobile manufacturer considers a remarkable life.

To permit concentration of wiring, the control panels for the furnaces are mounted on top of the furnace cases with the pyrometer recorders facing its loading end. There they are within range of the operator's vision at all times. Overhead or roof-type heating units are employed, all being mounted so that they may be removed through the side wall of the furnace. Each heating unit consists of a nickel-chrome cast frame in which are mounted comb-type porcelain insulators. Through the insulators are strung nickel-chrome ribbons. In designing the heating units it is specified that the watt dissipation per inch square must exceed 8.

Each furnace is divided into three heat zones, each of which is provided with separate heating elements, and all of them are under automatic control. To facilitate the removal of a burned-out unit, panels are provided in one side of the furnace on a level with the heating unit in the roof. When a unit burns out, the corresponding panel is removed while the furnace is still in operation, the connections to the unit are removed, the heating unit is withdrawn and replaced by a new one, connections are restored, and the panel on the side of the furnace wall is replaced. This operation can be performed without shutting down the furnace by merely reducing the production 40 per cent. Furthermore, the change can be made in just twenty minutes, according to test. The life of the heating element is not definitely known, but at a temperature of 1,500 deg. F. this automobile manufacturing company, as a rule, has obtained 7,200 hours of continuous service before a failure.

Time Rate of Heating and Cooling Definite

The electric furnaces are open on the loading end, the work being pushed into them on T-section rails. For hardening connecting-rod forgings the furnace temperature is maintained at 1,500 deg. F., the connecting rods requiring sixteen minutes in the furnace. They leave the furnace through a water seal at the discharge end, from which they are carried by means of a continuous conveyor through the quenching bath into stock barrels. The quenching medium is water maintained at a temperature of 90 deg. F. The temperature of the furnace is controlled within a range of plus or minus 3 deg.

Inasmuch as the pusher is mechanical and functions twice a minute, since the furnace temperature is practically constant, and because the quenching medium is maintained within a few degrees plus or minus of 90 deg. F., the factors mentioned constitute a cycle of heating and cooling which is so synchronic that the company has been able, through Brinell inspection of the quenched product, to pick out high-carbon or low-carbon steel within the analysis specification range.

Connecting rods are drawn at a heat of 1,020 deg. F. in a furnace similar to the hardening furnace previously described. Both furnaces are water-sealed at the discharge end.

With a room temperature of 70 deg. F. and with a furnace temperature of 1,500 deg. F., the company is able to harden 12 lb. of steel per kilowatt-hour. The cost per pound of hardening the steel is as follows:

	Cents per Pound
Energy per pound of steel, at 1 cent per kw.-hr...	0.083
Labor handling, 27 lb. connecting rods per minute two stock handlers, at 75 cents per hour.....	0.092
Overhead expenses, at 75 per cent of labor charge	0.069
Total	0.244

To draw the temper in the steel connecting rods at a temperature of 1,020 deg. F. the cost per pound is as follows:

	Cents per Pound
Energy, at 30 lb. per kw.-hr.....	0.033
Labor	0.092
Overhead expense	0.069
Total	0.194

Adding these totals, the expense of hardening and drawing, which constitutes the complete heat-treating cost, is seen to be 0.438 cent per pound of connecting rods.

Increased Use of Electricity in London

AN OFFICIAL return of the electricity supply in the London and Home Counties Electricity District for the year 1922-23 and showing the number of kilowatt-hours sold has just been issued by the London County Council. Of the "local authority" undertakings the highest number of consumers among the metropolitan borough councils is in St. Marylebone, London, where the total is 14,140, and the lowest is Bethnal Green (London), where they number only 1,362. Wimbledon (Surrey) has the largest number of consumers of the municipal corporations, with 10,654, while of the urban district councils Ilford (Essex) has top place with 7,605 consumers and Dartford (Kent) the lowest with 749. Among the company undertakings, the highest number of consumers of the London companies is that of the County of London, with 48,500, and the North Metropolitan Supply Company, with 9,920, holds first place in the companies outside London. The total amount of energy sold by metropolitan borough councils was 213,651,885 kw.-hr., compared with 180,560,-645 kw.-hr. in the previous year; the local authorities outside London sold 147,335,627 kw.-hr., against 125,447,-062 kw.-hr. in the previous twelve months; the London companies sold 313,972,251 kw.-hr., compared with 278,919,248 kw.-hr., and the companies outside London disposed of 98,809,844 kw.-hr. The grand total in the London and Home Counties Electricity District was 734,139,775 kw.-hr., as compared with 640,153,662 kw.-hr. in the preceding year.

Letters from Our Readers

Economics of Distribution and Kelvin's Law

To the Editor of the ELECTRICAL WORLD:

In the issue of the ELECTRICAL WORLD for Nov. 29, 1924, there appeared an article on "Economics of Distribution" in which an extension of Kelvin's law for the economical design of electrical lines is developed. The generalized statement concluding the article is an amplification of Kelvin's law which is mathematically accurate and which may be very useful in the solution of many problems. In the preceding work, however, several errors are introduced, some of them quite fundamental. These are such that many of the conclusions drawn may be seriously questioned. It is felt that these errors should be pointed out for the benefit of those who might attempt to apply the conclusions to their problems without making a fundamental study.

One objection to Kelvin's law itself is that, while mathematically accurate for the assumed conditions, unless thoroughly understood it is likely to be applied to conditions for which it is not adapted. Especially is it dangerous to attempt to draw any general conclusions from work involving the use of specific cost data. Costs vary considerably from time to time and from one locality to another, and a solution most economical for one condition might not be so for another.

The cost data used here also are open to criticism as being derived from various textbooks and not being recent costs on a single system. The formula (2a) for cost of secondary wires, which, it is asserted, is derived from Reyneau and Seelye's "Economics of Electrical Distribution," does not appear in that book in any such form, and any data from which it might have been made up were given solely for the purpose of example, as is clearly stated in several parts of the book. Incidentally the development of this formula into an expression for "cost per 1,000 ft. per ohm" is not logical, since equation (2a) includes a term not dependent on wire size and wire cost varies inversely with ohms. A number of definite conclusions are drawn under the various "cases" in this article which are based on the use of such data.

Under case I, equation (1), $IR = \sqrt{a/(b + c)}$, is given as the most economical voltage drop per 1,000 ft.; similarly in case II, equation (10), IR represents voltage drop only with direct current and approximately with 100 per cent power factor alternating current. For lower power factors the drop is very different. Gear and Williams, from whom this expression is quoted, were careful not to call this quantity voltage drop.

The relation between the economical voltage drop for distributed loading and for concentrated loading is given as $\sqrt{3}$ (in case I). It can be easily shown that this should be $\sqrt{3/2}$, since for the same current the voltage drop with concentrated loading is twice that for distributed loading. Apparently in obtaining equation (3) no allowance is made for the cost of the neutral wire of the three-wire main. This would increase c. Further, just below equation (4) the economical transformer spacing is computed using the 2 per cent limit in voltage drop as to load center only, whereas it should apply to the end of the secondary. These errors tend to compensate each other, but do not entirely do so. They probably account for the discrepancies which the author notes between his results and those based on Reyneau and Seelye or Gear and Williams. Also, just before equation (5) the current for 1 kw. at 230 volts is given as 2.17 instead of 4.35. Since these figures are carried through all the work in case I and case IV, the figures drawn and conclusions reached cannot be depended upon.

In case II, equation (10), the exponent of R should be $(m - 1)/2$ instead of $(1 - m)/2$. Under "Generalized Statement," equation (30), there should be another factor a in the last term.

In general the writer believes that errors will be avoided and a better understanding of the results reached without adding appreciably to the work if, when studying a problem of this kind, the general method is used; i.e., if all known cost factors are assembled, set up in a general equation for total annual cost, and that equation studied for minimum values, etc., rather than to apply short-cut methods such as Kelvin's law. For example, the solution is considerably different in determining the most economical load for a given line, transformer, etc., from that in determining the most economical wire size, etc., for a given load. Sometimes also the cost of other parts of the construction varies with the wire size, etc., and this would not be appreciated unless all cost elements were set down. The general method applies as well to considerations of most economical voltage, route, span and other variables as to wire size. Any work which will simplify such studies and stimulate their application to distribution practice should be encouraged. Great care should be taken, however, that such work is perfectly general in its application.

HOWARD P. SEELYE.
Detroit Edison Company,
Detroit, Mich.

Performance of the Mercury Rectifier

To the Editor of the ELECTRICAL WORLD:

In the editorial entitled "The Mercury Rectifier Far Advanced in Europe" published in the ELECTRICAL WORLD of November 22 you state that "a short circuit is still a troublesome factor, experience showing that the rectifier is the first of all equipment to go out in cases of short circuit." Permit me to refer you to an article published by R. L. Morrison in *Engineering* (London), October 19 and 26, 1923.

This author refers to an oscillographic record curve. The curve refers to a rectifier rated at 1,800 volts direct-current and 400 amp. The record shows that the current reached 8,700 amp. before the breaker cleared, the peak reached corresponding to about twenty-two times normal current. Such currents have no effect on the rectifier, which can be switched in again immediately afterward. At the time of the tests sixty similar short circuits were applied in two days. The rectifier was then examined and found to be precisely in the same condition as when sealed up before the tests.

A further concrete example of rectifier performance is that of the Midi Railroad substations in France. The official report of the railroad company issued at the end of the guarantee year says that in one substation alone about 500 short circuits were sustained without any trouble arising. Mr. Morrison is justified in asserting that "the superiority of this form of converter for heavy short circuits is undeniable."

G. W. SWALLOW,
Scintilla Magneto Company,
Chicago, Ill.
American Representatives
Brown, Boveri & Co., Ltd.

[Comment on a similar discussion of mercury-arc rectifiers under short circuit was printed in the ELECTRICAL WORLD for December 13, 1924, page 1260. This letter is also printed, as it adds to the information on their behavior under such conditions.—EDITOR.]

President of Lighting Class Testifies to Its Permanent Value

To the Editor of the ELECTRICAL WORLD:

In a recent issue of the ELECTRICAL WORLD I noticed an editorial telling of the success of the N. E. L. A.-I. E. S. illuminating engineering course which was recently completed. As president of the class, may I have the privilege of outlining this course a little more in detail in order that the industry may get a better idea of the results obtained:

As you know, this course was primarily for electric light and power company illuminating engineers, and it was admirably arranged for maximum effectiveness. First, there was a series of seven lessons with parallel reading on each lesson, in addition to the regular text-books. Written recitations and problems were required periodically on the various subjects and mailed to the headquarters of the training course committee at Chicago to be graded, after which they were returned. An examination of the entire home study course was held in Chicago on the morning of October 6. This home study course was followed by a very valuable tour of inspection to various factories and cities of the Middle West and East, including Chicago, Cleveland, Washington, New York and Boston. Instruction was continued during the entire three weeks of this tour. The course was concluded by attendance at the I. E. S. convention at Briarcliff Lodge, N. Y., October 27 to 31.

Representatives from twelve electric light and power companies from different parts of the United States and Canada completed this first N. E. L. A.-I. E. S. course.*

Personally, I feel that as a result of this course my knowledge and experience have been considerably broadened. I have also benefited materially through my acquaintance with the men who composed this class, as well as by coming to know some of the important men engaged in the industry. I believe that I voice the opinion of every member of the class in saying that under no other conditions could any of us have obtained so thorough and profitable knowledge.

From the viewpoint of the electric light and power company, I believe that every member of the class is equipped with sufficient knowledge to render a service invaluable both to his company and its customers. This will serve to bring customer and company closer together, thus creating between them relations whose value cannot be measured in monetary terms but will surely prove this course to have been a profitable investment on the part of the company.

This class was organized in Cleveland on the night of October 12. Officers were elected and arrangements made for the continuous interchange of problems and results among the members of the class, as well as the various lighting organizations, in order that each of us may keep in constant touch with the lighting activities in the different parts of the country and learn of results obtained through the various policies and methods. In order to retain the distinction of being the first N. E. L. A.-I. E. S. training class in illuminating engineering, the "Lighting Service Club" was adopted as the name, and it is our intention to co-operate with all lighting organizations for the betterment of the industry.

On behalf of the class I wish to extend our sincere thanks and appreciation to all those who contributed to this course, and do very strongly urge and recommend similar courses to be held as often as possible in the future. The "Lighting Service Club" stands ready at all times to do its share.

FRANCIS E. PRICE,
President Lighting Service Club.
Georgia Railway & Power Company, Atlanta, Ga.
Headquarters Lighting Service Club.

*A photograph and list of these men and their company connections appeared in the ELECTRICAL WORLD for December 13, 1924, page 1276.—EDITORS.

Grounding the Neutral

To the Editor of the ELECTRICAL WORLD:

I have just received the ELECTRICAL WORLD for October 4 and have read with great interest Mr. Hale's lecture on "Evolution of Wiring." It is to me a matter of the greatest surprise that the American Electrical Code does not insist on the neutral wire being efficiently grounded at every consumer's house and that no fuses, switches or any interruption of any kind be allowed in the neutral. If this system be followed, then the easy, natural evolution is that there shall be no insulation at all on the earth wire and that the insulation shall be concentrated on the live or phase wire. All appliances must then be connected to polarity plugs by which the appliance is first firmly and safely connected to earth. This is the only logical system from both a theoretical and a practical point of view. Why, therefore, is it not adopted?

A GROUNDED NEUTRAL IN CHINA

For some years past I have insisted on this method of wiring in the electrical system under my charge, and one of the results is that our annual distribution and transforming losses have the low figure of 7 per cent. We have our 5,000-volt generators grounded at the star point, and our low-tension 380/220-volt four-wire system is solidly grounded at every transformer station and at every house. The house service connections are brought in through a pole fuse on a lead-covered phase wire and a bare neutral which is looped into the meter. The greatest care is taken to see that the neutral bare wire is looped into connections and not broken in any way, and is connected to the water piping at every house.

R. A. WILLIAMS,
Engineer and Manager Electricity Department.
Council Offices,
Tientsin, North China.

Providence "One-Piece" Electrically Welded Vessel Not the First

To the Editor of the ELECTRICAL WORLD:

In the ELECTRICAL WORLD for December 27, on page 1374, is shown a picture of a barge manufactured by the Saxe Providence Boiler Works which was called the first "one-piece" vessel welded by electricity. Please note that back in 1912 Frank Gary of Ashtabula Harbor, Ohio, welded a tug completely by the use of a Lincoln welder. There is not a single rivet in it; even the fitting, wiring and all that sort of thing were put up by electric welding. Since that time I understand that there has been made in England a cross-channel barge also entirely welded without a single rivet in it—this was built in 1917.

J. F. LINCOLN,
Vice-President.
The Lincoln Electric Company,
Cleveland, Ohio.

Central Station and Industrial Practice

Reconditioning Old Meters

By KARL H. BAUSMAN
Supervisor of Meters Dayton (Ohio) Power & Light Company

METERS of the Dayton Power & Light Company which are removed from service because of defects, change in capacity or discontinuance of use are returned to the service building of the company and placed on the "removed from service" racks. From these racks they are taken by the meter-test division and compared with rotating standards, the "as found" performance being recorded on a meter test slip, Fig. 2. If the meters are not found serviceable, a meter department work order, Fig. 1, is made out in duplicate, one copy attached to the meter and the meter hung on the "repair rack" for attention. The tracer copy of this meter work order is then placed in a tickler file.

METER DEPT. WORK ORDER 4327

DATE _____ CO. No. _____

INSTRUMENT _____

WORK TO BE DONE _____

DATE WANTED _____

CHARGE TO _____ BY _____

FIG. 1—METER WORK ORDER

The meter repairmen constantly keep after the meters needing attention, being guided in their work by the meter work order attached to the meter. After repair work has been completed on a meter the nature of the work is recorded on the back of the work order.

Single-phase and direct-current three-wire meters having potential taps which are removed from service are rebuilt in the meter repair room, 230-volt potential circuits being substituted for these meters and the potential circuit being connected across the outside wires, thereby eliminating the potential tap. Single-phase and direct-current 230-volt, two-wire meters which are removed from service are rebuilt into three-wire meters, thereby making them adaptable to either two-wire or three-wire installations. No 230-volt two-wire meters are kept in stock, which eliminates the possibility of installing a two-wire meter on a three-wire job. It also makes the meter stock much more flexible.

In rehabilitating the meters the work of repainting them has been expedited by cleaning the cases with a rotary wire brush which removes all paint and by lacquering them with an air-brush inside of a cabinet ventilated from outdoors by means of an exhaust fan.

After the meters have been repaired they are returned to the test-board and calibrated with rotating standards again, the "as left" test being recorded on the same slip that was used for the "as found" test. On all removed meters a careful inspection is made of the jewels, pivots, registers, general condition, etc., and all indexes are set back to zero.

After being tested the meters are hung on the tested stock rack, being grouped under six classifications—single-phase, polyphase, direct-current, voltage, wire and ampere capacity.

LABORATORY TEST

INDEX MAKERS NO. CO. NO.

AMP. LEFT FOUND VOLTS LEFT FOUND WIRE LEFT FOUND PHASE

MAKE TYPE LEFT FOUND DISK K. LEFT FOUND TEST K. LEFT FOUND

DIAL K. LEFT FOUND R. R. LEFT FOUND CHANGES

REASON FOR TEST COILS IN SERIES?

		M. R.	H. K.	M. W. H.	S. R.	S. K.	S. W. H.	% ACCY.	M. R.	H. K.	M. W. H.	S. R.	S. K.	S. W. H.	% ACCY.
P. F. 1.00	FOUND														
	LEFT														
P. F. 80 LAG. PHD.															

UPPER ELEMENT LOWER ELEMENT

REPAIRS

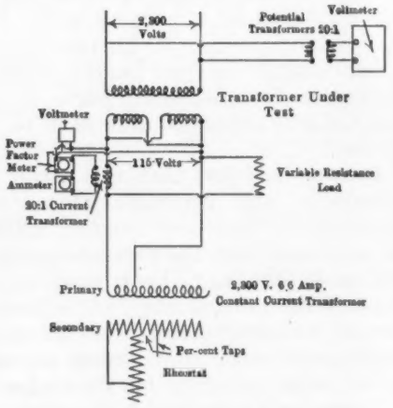
TESTER DATE

FIG. 2—METER TEST SLIP USED BY THE DAYTON COMPANY

Inductive Tests on Small Transformers

By B. A. FLESHMAN
Engineer Public Service Company of Colorado, Denver, Col.

IN CONDUCTING regulation tests on small distribution transformers at 80 per cent power factor at various loads difficulty is usually experienced in getting an inductive load that can be varied for different loads. For this purpose a station-type constant-current transformer has been used by this company. The transformer is excited on primary from the 5 per cent tap, this giving enough excitation to permit full-load current to be obtained from the 5 per cent tap on the secondary. Across the secondary of the constant-current transformer a variable resistance is placed so as to vary the load on the constant-current transformer.



METHOD OF OBTAINING 80 PER CENT POWER FACTOR FOR TESTING TRANSFORMERS

The primary of the constant-current transformer is placed in parallel with a resistance load across the secondary of the transformer under test. By varying the resistance load on the transformer under test and varying the resistance across the secondary of the constant-current

transformer and the distance between the primary and secondary coils, the load on the transformer under test could be varied and the desired power factor at any load be obtained.

This method of loading resulted in a considerable saving of time since no change in hook-up or equipment was required for various loads.

Portable Power Plants for Coal Mines

A RECENT development in the application of electricity in coal mining is the introduction of the portable electric power plant which makes available at whatever place it is desired the power required for operation of coal-cutting machines and eliminates the dangerous overhead wire. The first formal approval of a portable electric power plant for use in gaseous coal mines has been given by the Bureau of Mines, following exhaustive tests of the machine at the bureau's experiment station at Pittsburgh.

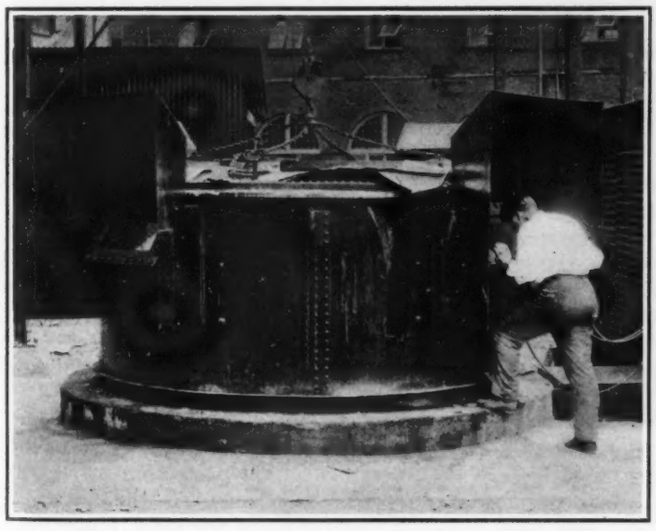
One of the chief sources of electrical accidents in coal mines is sparking or arcing of the electric wiring. There is always the danger that the resulting spark or flame may ignite explosive gas-and-air mixtures in the surrounding atmosphere and thus produce a disastrous mine explosion. A wide application of the electric storage battery on mine locomotives and portable power plants may be the solution of this problem by doing away with all permanent wiring in gaseous or dusty coal mines.

Other advantages claimed for the portable power plant are that it permits the elimination of feeder circuits and that it permits more rapid and satisfactory operation of a coal mining machine, owing to uninterrupted power supply and non-fluctuating voltage conditions.

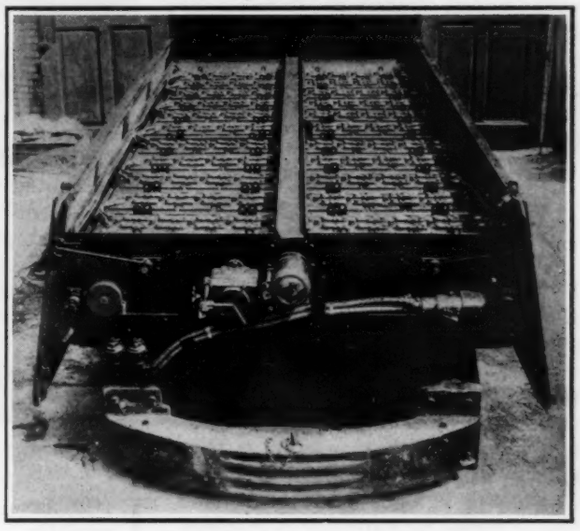
The portable electric power plant approved by the Bureau of Mines consists of a special locomotive-type truck containing battery cells of sufficient number and capacity to operate a coal-cutting outfit. Its weight complete is from 10 tons to 12 tons. An individual service plug and receptacle is provided for connection of the mining machine cable to the battery. The mining-machine circuit is fused at the battery box with the same type of combination fuse and switch as is used for the main circuits of the truck. With this arrangement the power can be cut off from the mining machine either at the cable reel or at the battery. The service plug is locked in place by means of a padlock, and therefore the power truck and coal-cutting machine operate together as a unit.

The motor, controller, resistance, main fuse box, headlight, headlight switch, headlight fuse box and ampere-meter housing, after having been subjected to rigid inspection and tests in explosive mixtures of Pittsburgh natural gas and air, were judged to be "explosion-proof" and to conform to the requirements set forth by the Bureau of Mines for "permissible" storage-battery locomotives used in gaseous coal mines. Like the flame safety lamp or any other safety equipment, the power truck can be relied upon as being safe only so long as it is carefully inspected and maintained in a safe condition.

Electric motors submitted to the Bureau of Mines for testing to determine their suitability for use in gaseous coal mines are tested at the Pittsburgh experiment station in a specially devised explosion chamber, consisting of a cylindrical steel tank embedded in a concrete base, and which is gas-tight. The motor to be tested is placed in the explosion chamber and the motor casing filled and surrounded with an explosive mixture of Pittsburgh natural gas and air, which corresponds closely to gaseous mixtures present in coal-mine atmospheres. An operator stationed at an observation window controls from outside the operation of the electrical apparatus. By means of a switchboard and control apparatus close at hand, the observer is enabled to open and close valves in the piping connections of the apparatus under test and thus to fill one or more compartments of the motor with the gaseous mixture. Spark plugs are installed at different points in the motor casing, and with the explosion chamber closed, the motor is run at its rated speed, the gaseous mixture within the motor casing being ignited by a spark plug, by a spark from the motor brushes or by any other means that simulates the conditions of actual practice in mines. The point of ignition of the gas-and-air mixture within the motor casing is under the operator's control. Pressure indicators are



METHOD OF TESTING MOTORS USED BY BUREAU OF MINES



APPROVED ELECTRIC POWER PLANT WITH COVER OFF

At left—Observer recording results of tests of electric motor in specially devised steel gallery at Bureau of Mines experiment station in Pittsburgh.

connected at various points in the casing, and a record is obtained of the pressure developed by the explosion in the compartment under observation. Tests are made to determine the point of ignition within the motor casing that gives the greatest pressure.

Not less than fifty tests of all kinds are made before the bureau's engineers will certify to the approval of a motor. In order that a motor shall pass these tests, it shall in none of them cause an ignition of the gas surrounding the motor or discharge flames from any part of the motor casing, and excessive pressure must not develop in any of the compartments.

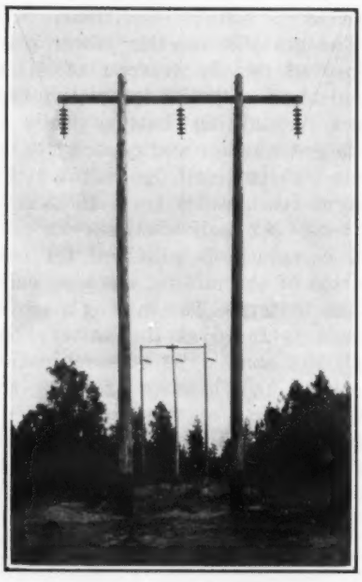
If an electric motor passes successfully the Bureau of Mines tests, it is placed on the "permissible list." Of approved electrical apparatus of all kinds, more than 200,000 units are now in operation in the country's coal mines. As an illustration of the great need for the wider use of "permissible" electrical apparatus in coal mines, it is pointed out that a recent disastrous mine explosion in Pennsylvania was caused by the use of an electric motor of the non-approved type.

Wooden Poles Used on 110-Kv. Line

DURING the past six months the Washington Water Power Company has been executing a program of transmission-line construction which will cost nearly $2,000,000 when completed. One of the important lines under construction is that known as the Intermountain line, which will extend from Long Lake power house to Taunton, a distance of 125 miles. About 80 miles of this line has been completed. This will be a 110-kv. line and will provide a second source of supply to the Cascade electrified division of the Chicago, Milwaukee & St. Paul Railway.

The two important generating plants at Long Lake and Little Falls have been tied in with Spokane with one 60-kv. double-circuit transmission line. A new 110-kv. line has just been built between Long Lake and East Spokane, a distance of 30 miles, where the new East Side substation of the company is at present under construction.

Virtually all of the new transmission lines are for 110-kv. operation. The construction is of the two-pole type, as shown in the accompanying illustration, with 50-ft. butt-treated cedar poles, set 8 ft. in the ground, with 22-ft. cross-arms and 10-ft. pole centers. Two $\frac{7}{16}$-in. stranded ground wires are used above the cross-



STANDARD TYPE OF 110-KV. TRANSMISSION LINE CONSTRUCTION USED BY WASHINGTON WATER POWER COMPANY

arms for the double purpose of strengthening the line and protecting it against lightning. Porcelain suspension-type insulators, 5 ft. in length, with six units, are used, and the conductors are seven strands of No. 8 copper.

Automatic Substation Cooling Systems

BY ARTHUR L. GREENE
Buffalo Forge Company, Buffalo, N. Y.

THE inauguration into service recently of the five new automatic substations of the United Railways of St. Louis affords an instance of the increased interest taken in the subject of ventilation of stations of this kind. The gradual but nevertheless certain displacement of the small-sized, low-speed motor by the larger and greater-speed machines, accompanied by automatic control, has brought about a growing dependence on mechanical ventilation for efficient operation. The obvious advantages connected with automatic control have attracted the attention of the electrical industry to this newest group of automatic stations, and it is now expected that a number of stations in other cities will install the automatic feature.

The five stations are designated by their street location—Franklin Avenue, Clark Avenue, Arsenal Street, Evans Street and Maple Avenue. All five stations are of similar design and have the necessary provisions for automatic machinery. The buildings are of brick construction with windows and doors at the front and rear. The Evans Street station is perhaps the most interesting of the five plants. It contains two modern 1,000-kw. converters equipped for complete automatic control. Two incoming 13,200-volt high-tension feeders are used with an automatic change-over which operates in case of trouble on either line. In the Franklin and Clark Avenue stations shunt-wound converters are operated with entire satisfaction in a congested district.

The unusual feature of these stations, however, is the automatic discriminating reclosing feeder equipment using high-speed circuit breakers to open the feeder circuits under excessive load. There are from two to six feeders in each station, controlling a total of twenty-one outgoing lines all equipped with automatic reclosing features. This device consists of a high-speed breaker, mounted on a structural-steel framework, together with line switches, reclosing relays and the usual instruments and protective relays. The breaker provides a satisfactory method of protecting commutating machines because the speed of opening on short circuit or overload is only about 0.008 second, or one-tenth that of the ordinary type. This type of feeder not only protects the station by opening any overloaded feeder, but also gives the very effective protection of high-speed breakers to the whole station. Excessive loads are thus interrupted before damage can be done to the converters. Added protection against overload is furnished by load-limiting resistors which are cut into the machine circuit when the gross load exceeds safe limits. This feature enables the stations to hold on to extremely heavy overloads instead of interrupting service.

Little thought of by the average individual perhaps in connection with the high operating efficiency of the equipment in the above substations is the part played by the ventilating apparatus. In connection with this several characteristics usually associated with electrical power stations should be borne in mind. Of first importance is the fact that the average substation is

crowded for space. In other words, a very close relation exists between the actual construction features of a building which is to house electrical machinery and the system which is to govern the ventilating of the machinery. The electrical equipment generates large quantities of heat, which is radiated to the surrounding air, and unless some method of positive removal is provided, the machinery will overheat and reduced efficiency will result.

Either the direct or the indirect method of ventilation may be employed. Perhaps the one greatest objection found with employment of the latter method, which acts on the principle of air diffusion, is that an excessive amount of fresh air must be handled in order to obtain efficient results. The importance of this must not be underestimated. It is calculated, for instance, that the air requirement for cooling a large generator under normal conditions will equal the weight of the machine itself every thirty or forty minutes of operation. The engineer must always bear in mind that high velocity requires a great amount of power.

The direct method of ventilation as applied here to substation air regulation has a unique advantage over other methods in that it effects at the exact place or places desired the positive control essential to maintain high efficiency. Precision in air control with this method is not an approximate amount. It is at one and the same time both positive and exact. The whole study of mechanical ventilation has made such strides the past few years that engineers now disregard all theories and practices of natural ventilation in the central station and substation. In its place has been substituted a duct system which takes the air in at one point and distributes it to the place or places desired as a water supply is piped. Between the points of entrance and of exit the air can be washed and humidified, cooled or heated.

In the average small substation situated in a residential or semi-residential neighborhood the air is not passed through an air washer before going through the generator units. Such precautions are taken generally in the case of a station situated in a very dirty, smoky location, such as near a railroad yard or near a group of industries producing quantities of gas, soot, etc. In cases of this kind cleaning the air of impurities before sending it through the generator or converter units is essential; otherwise frequent breakdowns would be the rule. The air requirements for the average substation of the kind described here are amply filled by observing a few simple precautions. It is customary, for instance, to lead the air into the building from as high a point as possible in order to avoid the dirt, dust and soot of the street. Provision is also made to protect the air outlet against the entrance of rain and snow. In some instances an intake duct for each machine is provided, rather than one large unit duct serving all.

Testing and Maintenance of Relays

Comprehensive Program Should Be Developed and Rigidly Carried Out—System Followed by Westchester Lighting Company Described

A COMPREHENSIVE periodic system of testing and inspecting relays was described by W. Jordan of the Westchester Lighting Company before the recent convention of the Empire State Gas and Electric Association at Syracuse, N. Y. The majority of companies test relays every six months, with monthly inspections. Some companies make tests on relays after every disturbance which causes a relay to operate. Although this practice is often necessary on the bellows-type relays, it is questionable for the induction type.

In the Westchester company relay testing and maintenance is handled by the relay department, which comes under the meter and test department. As new installations are put into service or old ones changed, the wiring for the relay, auxiliary relays and control is checked by the relay department to insure proper connections and operations before going into service. The settings are given out by the engineering department. The relay department makes all settings, and persons outside of this department are not permitted to change the adjustments.

All relays of the induction type are tested for minimum pick-up value and, in addition, not less than five points on the curve. This is done to have the characteristics of all relays brought out to the flat part of the curve. The time settings are given out in cycles, which is to insure that there will be no error from seconds to cycles or vice versa. This has been a valuable aid. The current settings are given out in primary amperes. Reverse-power relays are tested so that the contacts close on the watt element with 5 amp. going through the series coil and a drop of 3 volts across the shunt coil.

Where cross-connected reverse-power relays are used, the secondary current circuits are checked by a low reading ammeter and not permitted to have an unbalance of over 0.5 amp. at full-load rating of current transformers. This is also done on differential relay protection for transformer banks.

The method of loading for testing relays is standard—a 30-amp., 110-volt G.E. meter testing rheostat being used. It is also used on 220 volts for short periods, which has been very satisfactory, because the majority of the cases are relays in the field tested with the requirements of current over 50 amp.

Care should be used in selection of testing circuits or loading devices, especially in the use of the

RELAY RECORD

WESTCHESTER LIGHTING CO.

Co. No. Serial No. Style No.

Type Size Maker

Location	Line	Phase	Trans. Ratio	Installed	Removed	Remarks

TEST RECORD

Date	Current Tap	Lever Set	Minimum To Trip	Time To Trip		Remarks
				Amps.	Cycles	

RELAY RECORDS USED BY WESTCHESTER LIGHTING COMPANY

phantom load boxes, when testing induction-type relays, which are particularly susceptible to wave form unless special care is taken in their design.

The device for timing relays used is a standard Westinghouse cycle counter, although there are various timing devices on the market that work equally well. A portable multi-

Westchester Lighting Company
RELAY TEST

Feeder No. _____ at _____

SET RELAY FOR
_____amps. to Pick up.
_____amps. to trip in_____cycles.

DATE						
Phase						
Relay No.						
C. T. Ratio						
Setting	Amps	Cycles	Amps	Cycles	Amps	Cycles
As Found						
As Left						
Tested by						
Date						
REMARKS						

FIELD CARD USED FOR ROUTINE TESTS OF RELAYS

range ammeter made by the Western Electro-Mechanical Company is employed. It is very convenient for testing owing to having seven ranges combined in one instrument: 2, 5, 10, 20, 50, 100, 200.

A small field card with the information pertaining to the relay settings, feeder number and location is arranged for both "found" and "left" observations.

The relay test card is turned over to the foreman of the relay department, where it is carefully checked and then turned over to the record department. Here the necessary information is entered on another record card, pertaining to the individual relay, known as a "relay record card." There is also a relay test card which has all the data concerning a line or feeder at one end of the station.

Relays on some lines or feeders which cannot at times be held off during the day are generally tested after midnight on Sundays. There are cases where the relay department must notify the operating department twenty-four hours in advance for a hold-off on certain lines or feeders. This oftentimes occurs when the overhead and underground departments have made requests for hold-offs for maintenance and repair purposes. In the majority of cases, however, feeders are tested without delay in getting hold-offs. Testing of relays on commercial circuits can in most cases be done during the day, because the majority of the substations have a transfer bus.

Following are the instructions for testing and maintenance of relays used by the Westchester company:

Acceptance Test. — For acceptance test procedure the system as laid out and agreed by the Metropolitan Meter Committee of the N. E. L. A. (May 5, 1924) is followed. All relays which successfully pass the required tests will be identified with a white tag marked "Tested," with the tester's name and date of test noted. All new relays are to be delivered to the laboratory for an acceptance test. The relays will then be placed in stock for future use.

Relays which fail to pass the required tests will be identified with a red tag marked "Defective," with the tester's name, date of test and cause of failure noted. These relays will be returned to the manufacturer for credit.

A record of the acceptance test is recorded on a test form in the following order: Name of manufacturer, type, rated frequency in cycles per second, rated operating voltage, rated current in amperes, style number, serial number, rating of potential taps and rating of current taps.

Mechanical Inspection.—All relays are to be subjected to a rigid mechanical inspection to insure against loose screws or other parts and to determine if the relay is properly assembled.

Dielectric Strength.—All relays are to be subjected to the following dielectric strength tests:

A potential of 1,500 volts, 60 cycles, is to be applied between all terminals (both alternating and direct current) connected together, and to the case, for the period of one minute. A potential of 1,500 volts, 60 cycles, is to be applied between the alternating-current terminals and the direct-current terminals for a period of one minute.

Minimum Operating Current.—On all overload relays or relays with overload elements the minimum operating current is to be determined on each current tap. A maximum error of 2 per cent is allowed.

Operating Time Curve.—On all overload relays or relays with overload elements data for determining the characteristic operating time curve shall be recorded for one current tap, preferably of 5 amp. This test shall include the time at minimum operating current, also maximum of 50 amp. and at least three other current values.

Shunt Loss.—All directional relays or relays with potential coils shall be tested to ascertain the losses at rated voltage.

Operation of Wattmeter Element.—All type "CR" relays shall be tested to insure operation of the wattmeter element with 4 amp. flowing through the series coil and 1 volt impressed on the shunt coil.

Polarity.—All directional relays are to be tested to determine the relative polarity between the series coil and the shunt-coil terminals.

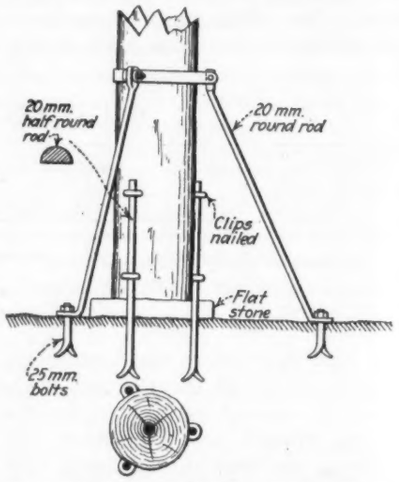
Ammeter Scale Test.—Relays with indicating ammeter scales shall be tested to determine the accuracy of the ammeter scales as follows: The relay will be tested on the current tap for which the ammeter scale is calibrated. The test will be made with secondary current corresponding to the primary current of a current transformer with a ratio for which the ammeter scale was calibrated at three points, viz., zero, nearest cardinal point to the middle of scale and highest scale. Any abnormal condition noted by the tester shall be recorded under remarks on test record form.

Records.—When the test is completed and the test data are properly recorded on the test record form, the tester notes the date of test and signs the form. The test form will then be filed in the "relays acceptance test file" until the relay is installed, when the test record will be attached to the history card and transferred to file under proper location of relay.

Unusual Method of Setting Poles in Norway

BY MAURICE HENRIOD
Société Européenne Ohio Brass Matériel Électrique, Paris, France

WHEN going through Norway the writer noticed a rather special wooden-pole setting in use for distribution lines and also for telegraph lines where the ground is hard enough to hold the pole and hooks, as shown herewith, or too hard to permit economical digging. This pole construction is widely used over the country and has given entire satisfaction to the operating



IN HARD, ROCKY GROUND POLES ARE SET IN THIS MANNER IN NORWAY

companies. The pole, being above ground level, does not deteriorate quickly and is said to be cheaper than any other means of pole setting under the conditions encountered.

Commercial Activities and Public Relations

Cooling System for Central-Station Offices

By Use of Air Washers, Ammonia Compressors and Ventilating Fans, Air Is Cooled in Summer, Adding to Comfort and Efficiency of Employees at Moderate Cost per Day

BY J. S. MOULTON
Assistant to Executive Engineer San Joaquin Light & Power Corporation, Fresno, Cal.

ONE of the most interesting features of the San Joaquin Light & Power Corporation's new office building at Fresno, which was completed in February, 1924, is an elaborate heating, cooling and ventilating system to provide comfortable working conditions through the wide variations of temperature and humidity peculiar to the San Joaquin Valley of California. In the design and construction of this building every feature which would help to improve the efficiency and comfort of employees was considered and those which seemed justified were installed. Six months' use of the cooling system has proved it to be a highly satisfactory investment, and it affords some valuable data as to the cost and amount of energy required in the operation of such a system.

The building, which was described in the ELECTRICAL WORLD for April 5, 1924, page 680, occupies a 75-ft.x 150-ft. space, attaining a height of 174 ft. at the roof and 235 ft. at the top of the radio towers. Of the ten floors, the first is used as a lobby, consumers' counter and display room for electrical merchandise. From the second to the ninth floor inclusive are housed the Fresno district and general offices of the company. The tenth floor is utilized as an auditorium and library. A completely equipped electrical kitchen is available for serving banquets, which may be held in the auditorium.

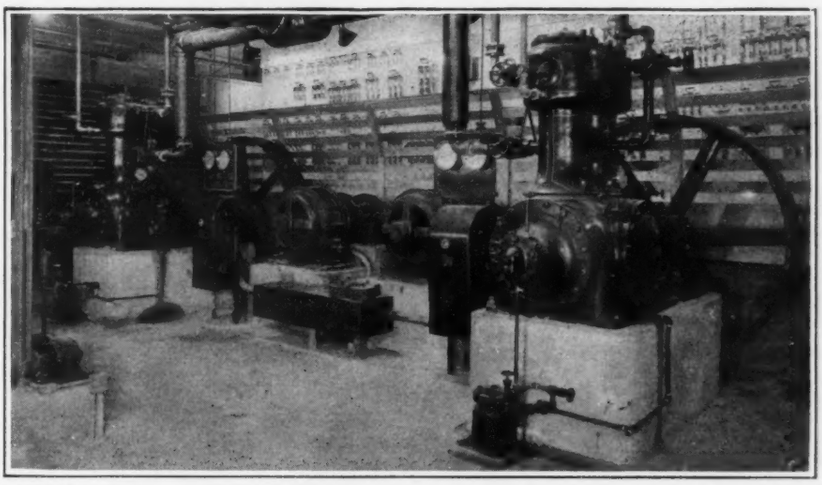
The air for the entire system, with the exception of the auditorium, is drawn in through an intake in the light well. Four B. F. Sturtevant air washers are used to cool this air. Two "type S," 14 ft. x 5 ft. each, and two "type C" air washers, one 6 ft. x 6 ft. and the other 6 ft. x 3 ft., compose this group. The water for use in these air washers may be taken directly from the city mains, or it can be chilled by passing over ammonia expansion coils supplied by two 50-ton refrigerating compressors. The use of the refrigeration is necessary during part of the summer months to provide adequate cooling without excessive increase in relative humidity.

The auditorium system draws its air supply through an intake near the roof, passing it through an air washer (type "H," 6 ft. x 7 ft.) which is supplied from the chilled-water tank in the basement. This washer is also arranged for recirculating the water, so that it can be used during the winter to remove dust and other suspended matter from the air.

The log sheet of the engine room is very complete in the information shown, helping the engineers on duty to keep close tab on the operation and presenting the information in concise form to those others in the organization who are interested from different angles in the results obtained. Data for the twenty-four-hour period ended at midnight July 2 are shown in Tables I and II.

The curves plotted from the log sheets show very vividly the cooling effect of the system during the extremely hot summer weather. The eight days shown were plotted from the records of the warmest weather experienced during the first part of the summer and show that as much as 25 deg. reduction in dry-bulb temperature was accomplished by the air washers. The record taken from a recording thermometer in one of the offices shows over a two-day period the temperature variations in the working space. The effect of the thermal capacity of the building is quite noticeable on this curve, since it is very much more uniform than either the outside or the cooled-air temperatures as measured in the basement.

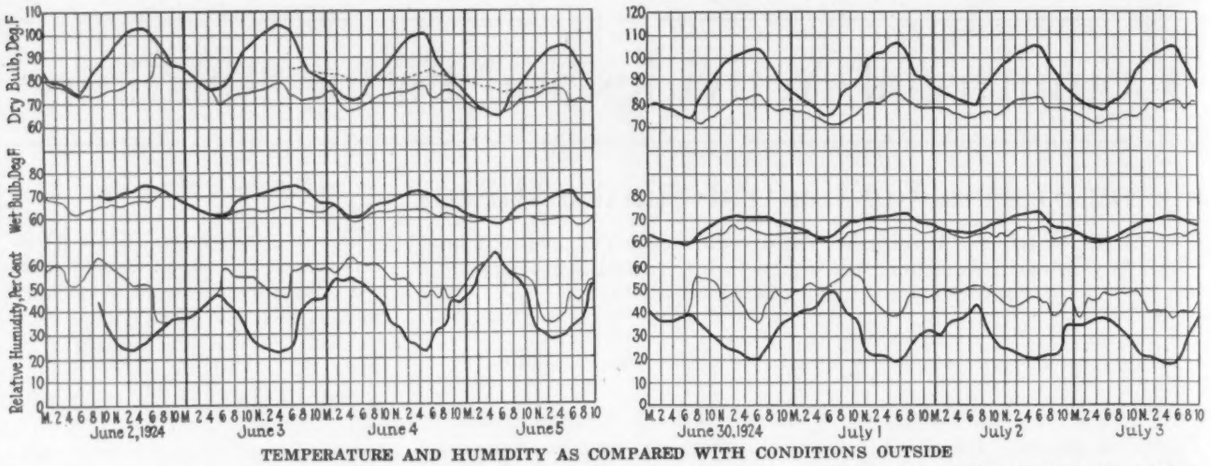
It has been found by experiment that the humidity in the building will be at least 5 per cent lower than that measured in the basement. It has further been found that a relative humidity in the office of from 40 to 45 per cent with a dry-bulb temperature of 80 deg. is very comfortable. Instructions have, therefore, been issued that the humidity after



TWO 50-TON AMMONIA COMPRESSORS USED FOR COOLING WATER IN AIR WASHERS

TABLE I—WATT-HOUR METER READINGS, JULY 2, 1924

	Present Reading	Former Reading	Constant	Kw.-Hr.
Totalizing	706	697	400	3,600
Light	7,705	7,679	16	476
Power	6,282	6,156	24	3,024
Blueprint	225	224	20	20
Kitchen	1	1	20	...
Main fan	803	786	20	340
Vesco power	100	100	10	...
Large elevator	700	693	20	140
Auditorium ventilator	7	7	20	...
Main exhaust	770	756	20	280
Small elevator	1,305	1,290	8	120
Refrigerator No. 2	352	337	40	600
Refrigerator No. 1	322	299	40	920
Floodlight	80	80	80	...
Vesco heating	0	0	8	...
Medical dept.	27	27	10	...
Roof sign	161	161	40	...
Auditorium light	17	27	30	...
Vesco light	212	211	60	60



TEMPERATURE AND HUMIDITY AS COMPARED WITH CONDITIONS OUTSIDE

Heavy line shows air conditions in intake before cooling, and light line shows air conditions after passing through air washers.

cooling in the basement shall be kept below 50 per cent at all times.

The total power used in the building is metered and billed against building operating cost according to published schedules applying to similar load furnished any consumer. For the six-month period from April to September inclusive this average rate has been 1.188 cents per kilowatt-hour. The ventilating fans for the main building during this period have used 64,040 kw.-hr., which at this rate would cost $760, or $4.15 per day. The cost for a twelve months' period will be less than twice this amount, as the fans will be operated at lower speed during the winter months. During the same period the refrigerating machines used, in conjunction with the cooling system of the entire building, 67,320 kw.-hr., costing $798, or $4.35 per day.

The cooling system as a whole has been extremely satisfactory in its operation, making the working conditions, particularly in the summer, much better than could possibly be obtained without it. Reference to the graphs of cooling produced should leave no doubt as to the justification for the expense of operating the cooling system. The cost is repaid many times over in increased morale and efficiency of the 350 employees in the building.

Parcel-Post Delivery of Carton-Lot Lamp Sales

A PROFITABLE method of selling incandescent lamps has been adopted by the Merchants' Heat & Light Company of Indianapolis through the active solicitation of this business backed up by parcel-post delivery.

The plan, which has been put into effect by R. R. Frey, merchandise manager, is intended to encourage carton sales of lamps with the understanding that deliveries will be made by parcel post. The customers of the company may also place their orders for lamps by telephone and the lamps will be delivered by the postman. Lamp sales by the carton have long been greatly desired by central-station companies as a means of lowering the number of empty sockets, and the plan in use by the Merchants' Heat & Light Company has greatly stimulated sales in this quantity. The number sold by this plan has exceeded by more than 40 per cent the lamps sold in any previous, similar period.

TABLE II—PERFORMANCE OF COOLING AND VENTILATING APPARATUS OVER TWENTY-FOUR-HOUR PERIOD

Time:	12	1	2	3	4	5	6	7	8	9	10	11	N	1	2	3	4	5	6	7	8	9	10	11	12
Refrigeration Compressor Pressures																									
50-ton head				110	115	170	170	115	165	165	170	175	175	173	180	175	175	175	175	178	175	165	160	160	155
50-ton back				25	35	35	35	25	25	25	25	30	30	32	35	35	40	40	40	40	40	35	35	35	35
50-ton head							170	115	165	165	170	170	170	170	175	170	175	175	180	180	175	170			
50-ton back							35	25	25	25	25	30	33	30	35	35	40	40	40	40	40	38			
Ice-water head									115	165	165	170	170	170	175	170	170	170	170	175	170				
Ice-water back									25	25	25	30	30	30	35	35	40	40	40	40	40				
Drinking-Water Temperature																									
Temp. supply, deg. F.		48	46						46	37	38	39	40	41	46	48	42	47	50	45	38	36	37	38	36
Temp. return, deg. F.		50	47						47	40	40	41	41	43	48	50	45	48	51	49	42	40	39	39	38
Air-Washer Water Temperature and Pressure																									
Temp., deg. F. in									38	40	42	45	45	45	48	48	49	49	50	51	49				
Gage pressure									15	20	30	30	30	30	30	30	30	30	30	20	20				
Temp., deg. F. in			54	54	44	39	38	37	37	39	40	44	44	44	47	52	54	54	55	56	54	50	48	49	49
Gage pressure			18	18	18	18	18	18	18	18	18	18	17	17	17	17	18	17	17	17	17	17	17	17	17
Temp., deg. F. in									38					46	48	48	50	50	51	52	50	46	44	45	45
Gage pressure									20					25	25	18	18	18	18	18	18	18	18	18	18
Temp., deg. F. in											40	44	44	44	46	47	48	48	49	50	48				
Gage pressure											27	27	27	27	27	27	27	27	27	27	27				
Intake Air Temperatures																									
Dry bulb			86	85	84	83	82	80	79	86	88	92	96	96	100	102	104	104	106	106	101	97	94	90	89
Wet bulb			64	66	65	64	64	64	64	66	67	68	68	69	71	72	72	72	72	73	70	68	66	67	66
Humidity			29	36	35	37	37	41	44	34	33	28	22	24	23	22	20	20	19	20	21	20	21	29	34
Main Air Supply, Temperatures																									
Dry bulb			78	78	76	76	74	79	75	76	77	75	76	77	80	82	82	82	83	84	79	79	79	78	77
Wet bulb			65	64	63	62	62	62	63	63	64	62	64	62	64	66	66	66	66	66	64	61	62	62	63
Humidity			50	46	48	45	51	51	51	48	49	48	52	42	41	43	43	43	46	38	44	39	37	40	46
First-Floor Air Supply Temperatures																									
Dry bulb			83	82	82	80	80	80	79	75	76	74	75	76	78	77	77	77	78	79	74	74	80	78	76
Wet bulb			66	65	64	64	64	64	63	62	62	61	61	61	64	64	64	64	64	65	62	62	62	62	62
Humidity			40	40	37	41	41	41	41	48	45	47	44	42	46	49	49	49	46	47	44	37	35	40	45

Preparatory to mailing, the lamp cartons are protected with corrugated board and carefully wrapped with paper and twine. Before putting the plan into effect Mr. Frey had a sample package prepared and submitted to the local post office inspector, whose approval was secured. The expense of delivery by this method has averaged 10 cents per sale. It has proved less expensive than other methods of delivery, and the increased sales indicate the approval of the central-station company's customers.

Radio Broadcasting an Aid to Public Relations

By W. G. Burrill
Publicity Manager Bangor Railway & Electric Company, Bangor, Me.

Radio broadcasting is playing an important part in the public relations policy of the Bangor Railway & Electric Company, which is broadcasting market reports and weather forecasts daily, church services occasionally and a regular entertainment program each Wednesday evening through its station WABI.

Before adopting a regular schedule of programs several test programs were broadcasted by the company, the most successful of which were those in connection with an electrical exposition held in Bangor last March. Replies from more than two hundred radio listeners were received from twenty-six states and from six Canadian provinces. Talks were broadcasted on electrical cookery and illumination. These were well received and commented favorably upon by radio listeners.

In response to numerous requests for further broadcasting, it was considered that the public served by this company certainly appreciated a local broadcasting station and that such a station could be used to further good will and a better understanding between the company and its patrons. The station was formally opened late in November with an address by Edward M. Graham, president and general manager of the company, who pointed out that the Bangor Railway & Electric Company was offering the services of this station to its customers and friends in the belief that such friendly co-operative effort will prove to be of the greatest advantage to the company, its patronage and the communities served, through bringing them into closer and more friendly relationship.

The local newspapers featured the opening of the station with front-page stories, and several hundred replies were received from local people expressing their pleasure that Bangor was to have a broadcasting station of its own.

Since the opening of the station talks have been delivered by prominent men of the town, and it is planned to broadcast talks on other subjects of local interest from week to week, as well as talks having more particular reference to the electrical industry.

BANGOR COMPANY BROADCASTS FROM ROOF OF ITS OFFICE BUILDING

Station WABI is now the most easterly radio station in the United States that is broadcasting regular programs. It has a capacity of 100 watts, and a wave length of 240 meters has been allotted to it.

A local music house of Bangor has co-operated with the company toward the operation of the station by placing at its disposal a music hall, fitted up as a studio, from which all regular programs are broadcasted. The hall is about one-half mile from the radio transmitter, which is operated from the studio by means of remote control.

The personnel of the station is made up entirely of employees of the Bangor company. No charge is made for the use of the station, and nothing is paid to those who take part in the programs. Local musicians and public men are glad to contribute their services for broadcasting.

In the near future it is planned to have a Bangor Railway & Electric night, on which occasion the talent for the evening's program will be furnished entirely by employees.

Revenue from Kitchen Units $8.16 per Customer

Actual increases in residential revenue of $8.16 a customer per year have been realized from the use of daylight kitchen fixtures sold by the new-business departments of the Ohio Public Service Company. This figure was obtained as the result of a recent survey in the Alliance, Mansfield and Warren divisions.

For comparative purposes 100 homes were selected in each division which had used the daylight kitchen fixtures with a 150-watt lamp for twelve months and which had not purchased any other electrical appliance since the installation of the lighting unit. Consequently the additional revenue from these residential customers, which, as just stated, averaged $8.16 a customer per year, was derived solely from the use of the kitchen fixture.

The new-business departments of the Ohio Public Service Company were among the pioneers in the sale of these units, having conducted the first campaign on the fixtures early in 1922. Since that initial campaign they have sold approximately 30,000 of the units, with an estimated yearly increase of gross revenue approximating $250,000. Also since that time a total of almost two million of such fixtures have been sold throughout the country. These sales, on a basis of the results shown in the survey in the three divisions of the Ohio Public Service Company, will add approximately $16,000,000 in residential lighting revenues to the receipts of central-station companies.

To Safeguard Flatirons

A SAFETY PRECAUTION!
Always
Pull the Plug Out
Keep Flatiron on Stand
Don't Do This
PLEASE TACK THIS CARD ON YOUR IRONING BOARD
The Hartford Electric Light Co.

To emphasize the importance of the correct use of electric flatirons the Hartford (Conn.) Electric Light Company sent out the card reproduced herewith to all its residential customers in December and also included the card with all new and repaired irons. The company believes that this in no way discourages the use of electric irons in general and that the thing to accomplish is the correct use of the iron and stand. This action has been brought about as the result of occasional fires and "near fires" caused by the improper use of flatirons.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Innwerk Hydro-Electric Plant in Bavaria.—F. KENNERNECHT.—With a total output of 76,000 kw., this plant, recently finished, represents the largest hydro-electric power station in middle Europe. It is situated on the River Inn and necessitated the building of a canal 20 km. long to obtain a useful head of 31 m. This completely cemented canal carries on an average 300 cu.m. of water a second. If, owing to engine trouble in the station, one or more of the waterwheels have to be shut down, the tailrace would deliver an amount of water smaller than permissible back to the River Inn, for which reason automatic siphons are installed along the canal. These begin to drain the canal as soon as its level rises beyond a determined maximum level. In the station are installed fifteen sets of turbine-generators, seven for direct current and eight for three-phase current, all of 5,750 kw. output. The energy from the former machines is carried in very heavy aluminum buses to a large electrolytic aluminum plant in the immediate vicinity of the station. The three-phase current is stepped up to 100 kv., and is transmitted to a distant nitrogen plant. A yearly output of about 465,000,000 kw.-hr. is expected.—*Die Wasserkraft*, Nov. 15, 1924.

Supply of Electrical Energy to Leningrad.—T. A. SKANAVI.—The history and the present state of the question are fully covered. A large number of diagrams are given. From one diagram it appears that the total supply reached its minimum at 1918 and is now rising again. — *Electritchestwo* (*Russia*), Nov. 4, 1924.

Superheated Steam Insulation. — R. H. HEILMAN.—The author has compared the prices of several types and thicknesses of heat insulation, in place, with the value of the heat saved by their use and has tabulated the results for pipes from 2 in. to 18 in., steam temperatures from 500 deg. to 900 deg. F. and costs from 15 cents to 35 cents per 1,000,000 B.t.u. To show the manner of computing heat loss through a compound covering, the equations are given together with a numerical example. — *Chemical and Metallurgical Engineering*, Dec. 15, 1924.

Generation, Control, Switching and Protection

Diagrams of Voltages in Three-Phase Synchronous Generators with Unsymmetrical Load.—PROF. FOLVINSKY.—A theoretical paper giving a full mathematical treatment of the problem. —*Electritchestwo* (*Russia*), No. 2, 1924.

Localized Correction of Power Factor.—R. E. MARBURY.—The advantages of using condensers are stated. Curves show the increase of line loss with decreasing power factor. Despite their higher first cost, low-voltage condensers are recommended for use with low-voltage motors because of the power saving, the loss in a 2,300-volt condenser with transformers being eight to ten times greater than the loss in a 230-volt condenser.—*Electric Journal*, December, 1924.

Time-Delay Overload Relay. — D. SNISELAAR.—In the more recent methods for protection of transmission systems there is a tendency to eliminate the time delay. More and more methods are used to disconnect the faulty line from the system instantaneously. But still it is found that a short delay is necessary to allow for transient overcurrent like transformer inrush currents. Most of the relays at present on the market have too wide a time range to allow setting closely for values

ACCURATE TIME-DELAY RELAY THAT CAN BE SET TO FRACTION OF SECOND

around 0.2 second. The relay described can be set easily for fractions of seconds. Other features claimed are a minimum number of parts, a wiping contact and considerable contact pressure.—*Sterkstroom* (*Holland*), Oct. 22, 1924.

Transmission, Substations and Distribution

Standardization of Cables.—W. F. GEBHARD.—The author discusses the proposed specifications for the standardization of cables in Holland. A complete table of standard dimensions for various sizes of cables is given.—*Sterkstroom* (*Holland*), Nov. 19, 1924.

Wooden Poles for High-Voltage Transmission Lines.—A. A. GLASOUNOFF and N. I. SUSHKIN.—The problem of how to make wider use of wooden-pole structures for transmission lines is receiving considerable attention in Russia today. Very satisfactory results have been obtained with structures similar to the type described in the ELECTRICAL WORLD for January 20, 1923.—*Electritchestwo* (*Russia*), No. 8, 1924.

Economic Distribution of Leading and Lagging Current for Several Machines in Parallel.—C. V. DOBBELER.—The author develops a diagram for the calculation of generating cost and transmitting cost of a current of any chosen phase displacement, considering the variable cost of current according to the load on the generator. The diagram is based upon the assumption that the phase-displaced current can be substituted for the mathematical analysis by a unity-power factor current the generating cost of which is exactly the same as that of the displaced current. This substitute current can be divided among several parallel operating dynamos for a minimum of cost, just like direct current. A simple geometric construction gives from this the most economic distribution of the actual watt and wattless currents. When this diagram is properly used, the amount of leading current which must be furnished by a phase-compensator to obtain the maximum saving is found. It will be seen that this maximum is not always reached for compensation to unity power factor. The diagram also discloses that the compensating apparatus operates economically only within certain limits. To go either way beyond these limits does not bring about a saving in current. If two power plants are operating together over a tie line, the diagram will furnish the magnitude and phase of the equalizing current to keep the total cost a minimum. — *Elektrotechnische Zeitschrift*, Nov. 27, 1924.

Hard-Drawn Copper Conductors.—This note reports the recent issuance of specifications by the British Engineering Standards Association and states where copies may be obtained.—*Electrician* (*England*), Dec. 5, 1924.

Units, Measurements and Instruments

Measurement of the Voltage Induced in the Short-Circuited Coil in Direct-Current Machines.—R. BAGGERMAN.—The author discusses briefly the methods used by Pichelmayer, Rezelman and Schenfer. Then he develops a simple method, applying alternating current and using only standard test instruments for measuring the power input and the voltage between bars. He points out which corrections are necessary, giving results of measurements made on two machines of different type. *Tydschrift voor Electrotechniek* (*Holland*), October, 1924.

Operation of Electrical Temperature Indicators and Recorders.—E. H. STIVENDER.—The operation of various methods that have been devised and used commercially is briefly described, with the aid of diagrams. Included are the thermocouple, the resistance system of the series type, bridge systems using direct or alternating current, the corresponding direct-reading bridge systems and the direct-current differential-coil system.—*Power*, Dec. 30, 1924.

Illumination

Comparison of Incandescent Lamps for 110/125 Volts and 210/230 Volts.—P. M. TICHODEEV.—A large number of tests have been made, all with lamps with tungsten filaments. The conclusion is that the low-voltage lamps (110-125 volts) are more advantageous for the customers and would be preferable.—*Electritchestwo* (*Russia*), No. 3, 1924.

Tint Variation for the Illumination of Store Windows.—J. WIEBINGA.—The apparatus used for stage effects has been perfected and simplified to such an extent that it can readily be

applied to window displays. The author gives a complete description, with diagrams, curves and photographs, of a small set made for this purpose. The lamps are hidden from view. Care is taken that a color combination does not reappear in any reasonable length of time.—*Tydschrift voor Electrotechniek (Holland)*, November, December, 1924.

Decorative and Theatrical Lighting.—CLAUDE BRAGDON.—The greater part of this paper, which was presented before the annual convention of the society in October, is devoted to a discussion of the use of colored lighting in the theater, and examples are given of the lighting of well-known productions. The influence of colors upon the emotions and the importance of lighting in hindering or aiding dramatic effects is considered. There are also examples of the use of colored lights for decorative purposes and a discussion of the lighting of concert halls. Finally "color music" is discussed.—*Transactions of the I. E. S.*, November, 1924.

Motors and Control

Single-Phase Collector Motor with Independent Excitation.—A. V. LEBEDERV.—A mathematical investigation, using graphical methods, is given according to the design of Behn-Eschenbourg. The theory was tested with an 8-hp. motor at the Politechnicum Institute of Leningrad.—*Electritchestwo (Russia)*, No. 3, 1924.

Steel and Electrical Engineering.—SIR ROBERT HADFIELD.—For mention of the first part of this article see *Digest* in the issue of December 27, 1924, page 1371. The present installment deals with properties of other alloy steels.—*Electrician (England)*, Dec. 5, 1924.

Electric Power Application in Pacific Northwest Fir Mills.—J. L. WRIGHT.—In addition to descriptions and illustrations, this paper gives, for a large number of applications in saw and planing mills, data on type of motor, horsepower, type of control and method of motor drive.—*A. I. E. E.* Journal, December, 1924.

Boston "L" Woodworking Shop Uses Individual Drive.—In addition to giving views, diagrams of lay-out and descriptive matter, this article contains a list of some fifty machines and specifies for each of them the horsepower, type and speed of the motor driving it.—*Electric Railway Journal*, Dec. 27, 1924.

Electrophysics, Electrochemistry and Batteries

Electrical Nitrogen Production.—OLAF JENSEN.—The intensive development of the ammonium process (the Haber process) in Germany for the production of nitrogen has made it very difficult for the Norwegian manufacturers, using the electrical method, to compete successfully. While the German industry produces between 300,000 tons and 400,000 tons of nitrogen per year, the Norwegian production is not greater than about 25,000 tons. The author discusses whether or not the electrical method can be further developed to meet this competition. He gives a detailed description of the process in the electric arc and arrives at the conclusion that the development of suitable electrodes is the most important problem which must be solved. He emphasizes the necessity for a systematized program of research on the arc phenomena, because the electric arc is bound to find—has, in fact, already found—important applications in other industries than the nitrogen.—*Teknisk Ukeblad (Norway)*, Nov. 19 and 25, 1924.

Traction

Main-Line Electrification. — L. DE VEREBELY.—Electrification of railroads has become an urgent economic necessity in Hungary because of the loss of the major part of her natural resources, following the war, and the need of utilizing to the utmost the remaining fuel deposits, including peat and lignite. To gain the recognized advantages of supplying the combined railway and other loads from the same power plants a locomotive has been devised which will operate at unity power factor on one phase of a three-phase, 50-cycle line. A feature is the phase converter, a synchronous machine with a three-phase stator winding in the inner slots and a separate single-phase winding in channels outside of them, and so arranged that there is a strong stray flux between the two windings. The direct-current field excitation is controlled by an automatic regulator so that the three-phase voltage applied to the traction motors varies as the square root of the load, while the primary voltage in the single-phase winding remains constant. The reason for the latter is similar to that for the behavior of an overexcited synchronous motor with series inductance on a constant-potential circuit. The leakage flux represents the inductance. The purpose of this design is to permit the use of low-speed traction motors at the relatively high frequency of 50 cycles, which is feasible if they are operated on a variable voltage as indicated above. In practice the regulation is made on constant unity (or near unity) power factor in the primary circuit. Some advantages claimed are (1) high efficiency over a wide range of load, (2) large permissible variations of line voltage, (3) high line power factor, (4) economy in substations because of wide allowable spacing, (5) slight line disturbance in case of incorrect switching because the short-circuit current of the phase converter is small, (6) system power-factor control by the railway load and (7) high over-all efficiency. The author explains the electrical performance with the aid of diagrams and curves. Illustrations are given of the first locomotive weighing 80 tons and having a one-hour rating of 2,700 hp., or 34 hp. per metric ton.—*Engineer (England)*, Dec. 5, 1924.

Telegraphy, Telephony, Radio and Signals

Nature and Reproduction of Speech Sounds (Vowels).—RICHARD PAGET.—The results of earlier researches in acoustics are first reviewed, and it is shown that each separate vowel sound depends on the presence of definite vibration frequencies, usually two, due to resonances set up in the vocal cavity. Experiments are then cited and the circuits illustrated whereby the same effects may be obtained electrically. In one of these a telephone is connected to two resonant circuits in parallel, tuned to correspond to the two acoustical frequencies desired. The oscillating currents set up when the main circuit is rapidly interrupted produce the characteristic vowel sound at a pitch determined by the frequency of the interruption. Another method uses the audible-frequency beats of a heterodyne receiver with two sending circuits. It is suggested that a study of the acoustical system in terms analogous to the four cardinals of the electric system—resistance, inductance, capacity and leakance—offers opportunity of useful research.—*Journal of the Institution of Electrical Engineers (England)*, November, 1924.

Practices in Telephone Transmission Maintenance Work.—W. H. HARDEN.—The paper, abridged from a fuller presentation at the Pacific Coast convention in October, describes methods developed in the Bell system in connection with repeater, non-repeater and carrier circuits. Schematic circuit diagrams and illustrations of equipment are given.—*A. I. E. E. Journal*, December, 1924.

Electrical Method of Producing Vowel Sounds and Its Application.—W. H. ECCLES and C. F. A. WAGSTAFFE. This paper was presented before the Physical Society of London. Oscillations of several definite frequencies are produced at the sending station and at the receiving station are made by a heterodyne method to produce an audible vowel sound, the characteristic of which depends on the several radio frequencies involved. The method is of theorectical interest, and its use in code communication was suggested.—*Engineering (England)*, Dec. 19, 1924.

Miscellaneous

The Rhine-Main-Danube Waterway Scheme. — L. C. HUGHES-HALLETT. — This scheme is of prime importance, not only as providing a new artery of traffic directly across the European continent from Rotterdam to the Black Sea for vessels of from 1,000 tons to 1,500 tons, but also as an important source of hydro-electric power in a densely populated region poor in coal and far from good mines. The thirty-three plants will have a total maximum output of 360,000 hp. and will be capable of generating 1,500,000,000 kw.-hr. annually. The company has joint rights making it possible to construct a large steam-power station in the Nuremberg-Furth industrial district, with 80,000 hp. available as a reserve. Construction on some of the stations is well under way. The building program for the entire project provides for an expenditure of about $17,000,000 per annum for ten years. The article includes information as to the rights, organization and financial plan of the company. — *World Power (England)*, December, 1924.

Organizing to Reduce the Cost of Power.—J. P. JORDAN.—In this article and one accompanying it by Terrell Craft on "Attacking Power Losses in Transmission and Utilization" steps are suggested in systematic analyses for reducing or eliminating power wastes in industrial plants.—*Industrial Management*, December, 1924

Scientific & Industrial Research

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

Research Completed

Floodlighting Projector

The increased use of floodlights for industrial purposes has warranted the design of a new projector having a heat-resisting semaphore lens in the front door and a heat-resisting prismatic glass reflector on the inside of the rear door.—*Crouse-Hinds Company, Syracuse, N. Y.*

Lead Sheath in Contact with Portland Cement

Six pieces of cable were embedded in a stiff portland-cement mortar. Three specimens were coated with plain mortar, and three were set in mortar containing 2 per cent of pulverized sodium silicate. One of each type of specimen was stored for two years and three months under three different conditions of humidity. The amounts of yellow oxide found varied from mere traces to a hard thin coating.—*Bureau of Standards, Washington, D. C.*

Illuminometer, Use of, in Motion Picture Industry

It has been the practice in motion-picture laboratories to adjust the distance of the light source from the printing aperture by trial, which involved lost time and lost film. By measuring the brightness of a glass diffusing disk at the printing aperture the correct position of the printing lamp can be quickly and accurately determined. When taking motion-picture negatives where the set involves considerable danger to the actors, a retake can often be made unnecessary by taking an illumination measurement before the picture is started to make certain that there is sufficient illumination. In making colored motion pictures it is essential that the illumination be adequate, and measurement before taking often saves the necessity of a retake.—*Davis H. Tuck, Journal of the Optical Society of America, Vol 9, page 308.*

Plaster, Sound-Absorbing

Ordinary plastered surfaces absorb from 1 to 3 per cent of the sound energy which strikes them, reflecting the rest. As a result of this high reflecting power of the bounding surfaces, sound produced within a room is prolonged for a considerable period after the source has ceased, which results in a marked amplification of the general intensity within the room. By the proper choice of aggregate and bonding material a plaster has been developed that absorbs from 10 to 30 per cent, depending upon the pitch. The maximum of the absorption curve falls in the neighborhood of 1,000 vibrations a second. A very marked reduction of the noise within rooms is effected by the use of this material on walls and ceilings. As a sound absorbent it is about as effective as heavy rugs or tapestry.—*Paul E. Sabine, Riverbank Laboratories, Geneva, Ill.* [This method should prove an effective means of reducing the noise of high-speed machinery.—EDITOR].

Pyrometer, Thermocouple Type, Automatic Compensation for

A thermocouple-type pyrometer requires a compensation or a correction for the temperature of the cold junction. The older methods consisted in immersing the cold junction in melting ice, in a vacuum bottle, in burying the junction, in using an electric lamp, steam or water jacket, etc., to maintain the temperature constant. We have developed an automatic compensation of the millivoltmeter for the temperature of the cold junction and of the instrument itself. It consists of a Briguet spiral made of two dissimilar metals and attached to the hairspring of the d'Arsonval movement. This spiral thus automatically causes the pointer to move on the scale by the amount required to compensate for the temperature error.—*Brown Instrument Company, Philadelphia.*

Ultraviolet Radiations from Incandescent Lamp

A convenient source of ultraviolet radiations is an incandescent lamp with a quartz bulb and with a filament run at an extra high temperature. However, such a lamp is difficult to make and to repair, and for these reasons a lamp has been developed with an ordinary glass bulb and a quartz window at the end of a long side tube. For details see *Optical Society of America Journal*, 1924, Vol. 9, page 337.—*D. C. Stockbarger, Massachusetts Institute of Technology, Cambridge, Mass.*

Voltage Regulators, Alternating-Current, Rheostatic Type

This regulator is especially applicable to installations where the exciters are of large capacity and low speed, thus having heavy field currents, where the time constant or rate of response to change in voltage on the field of a generator is slow, or in installations where it is necessary to keep the excitation voltage at a constant value. The resistance in the generator-field circuit is changed by means of a high-speed, motor-operated rheostat. The motor of this rheostat is controlled by the main contacts of the control element of the regulator. The action of the main contacts of the control element are primarily controlled by the alternating-current coil of the control element.—*Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.*

In Progress or Purposed

Bimetallic Bars, Theory of

Bimetallic bars are employed in thermostatic controls and for temperature compensation in instruments. Although such bars are widely used, no satisfactory theory of their performance has yet been developed, and an investigation of the subject has been started. The work so far has covered the development of a performance theory in its most general form so as to include the curvature of the bars both longitudinally and laterally. The theory has been tested experimentally for several invar-brass bars, and the experimental and theoretical deflections have been found to agree within less than 10 per cent.—*Bureau of Standards, Washington, D. C.*

Fatigue, Effect of, on Magnetic Properties

The Bureau of Standards is undertaking to study the effect of mechanical fatigue on the magnetic properties of steel, and a Haigh alternating-stress machine has been obtained for this work. This machine is electromagnetically operated and applies repeated cycles of axial stress to the specimen under test at the rate of about 2,000 per minute. This investigation is part of a more comprehensive program for the investigation of the possibilities of magnetic analysis for the non-destructive testing of wire hoisting rope.—*Bureau of Standards, Washington, D. C.*

Iron Losses in Rotating Electrical Machines

The purpose of the investigation is to measure the effect of the various factors which determine the magnitude of the surface losses in laminated iron surfaces placed opposite to rotating slotted surfaces in the magnetic paths of an electric machine. So far $\frac{1}{4}$ in. bessemer steel punchings have been tested without special insulation between plates.—*A. C. Lanier, University of Missouri, Columbia, Mo.*

Magnetic Fields, Production of Intense

Dr. P. Kapitza's work, under the supervision of Sir Ernest Rutherford, on a research into the production of intense magnetic fields has been continued and has produced some very important results. A paper describing the fundamental scientific principles of the methods employed has been communicated to the Royal Society (*Proceedings*, 1924, Vol. 105 A, p. 691). Arrangements are under consideration for the extension of this work in purely scientific directions, from which results of considerable interest may be expected.—*National Physical Laboratory, London, England.*

Metallic Coatings, Exposure Tests on

It is proposed to run life tests, in connection with the methods of manufacture, on the following kinds of metal coatings: Hot-dipped galvanized sheets, hot-dipped galvanized wire products, hot-dipped galvanized structural shapes, hot-dipped galvanized castings, terne-coated sheets, lead-coated sheets, sherardized castings, electro-zinc plated castings, zinc-coated sprayed castings, zinc-coated sprayed structural shapes, cadmium plated castings and calorized castings.—*American Society for Testing Materials, Philadelphia.*

Tractive Resistance of Vehicles on Highways

A gasoline-electric truck has been built and completely equipped for making tests. Brake tests have been made to determine the tractive effort delivered to rim of wheels for varying currents. Tractive resistance at low speeds has been determined on concrete and asphaltic surfaces, also on several types of earth roads in good condition. Consistent results were obtained in practically all cases.—*W. H. Browne, Jr., North Carolina State College, Raleigh.*

Suggestions for Research

Dielectric Constants of Liquids, Measurement of, With Differential Electrometer

The suspended system includes two cylindrical quadrants, C_1 and C_2, suspended so as partly to overlap two fixed cylindrical plates, A and B, coaxial with C_1 and C_2 and so placed and connected that the torque due to the condenser AC_1 is opposite to that due to the condenser BC_2. To determine the dielectric constant of a liquid, one of the condensers is immersed in it and the other immersed in a liquid or gas of known constant, and the differences of potentials $V_A - V_1$ and $V_2 - V_B$ for zero deflection are read. For details see *Physical Review*, 1924, Vol. 24, page 396 (A. P. Carman).

Electrostatic Fields, Alternating, Method of Exploring

An alternating difference of potential is maintained across the electrodes between which it is desired to determine the field. A small test conductor is located on the equipotential surface whose potential is to be measured and is connected through a detector of alternating currents to the sliding contact of a wire connected across the same alternating-current voltage. Absence of current through the detector indicates the desired potential on the slide wire. For details see *Zeitschrift für Physik*, Vol. 19 page 136, 1923.

Insulators, Voltage Gradient Reduction in Air

In a paper presented at the Pacific Coast convention of the A.I.E.E. in October, 1924, A. O. Austin showed that strings of insulators can be made of such dielectric strength that a flashover would take place directly from the line conductor to the ground or the tower. See in particular his Figs. 1 to 4 and 7 to 7-B. He recommends the use of "insulate controls" in the form of rings or projecting parts, made of porcelain, to reduce the voltage gradient in the immediate vicinity of the conductor. This proposal may be of considerable importance in the new 220-kv. lines, and it is desired to investigate the protective action of such controls, as compared with guard rings made of metal, as previously proposed.

Heating of Electrical Machinery

Assuming heat interchange between the machine and the ambient medium to be proportional to the difference in temperature, the heating and cooling curves theoretically become exponential curves. See "Experimental Electrical Engineering," V. Karapetoff, Vol. II, pp. 69 to 74. In reality such curves often depart from an exponential form. It is desired to establish a more accurate law for heat interchange and from it to deduce equations of heating and cooling curves which will check more closely with experimental results. The coefficients of such curves will then be true constants of the machine, to be used in a predetermination of its temperature rise under any given conditions.

News of the Industry

Demands More Falls Power

Schoellkopf Points to Exhaustion of Present Supply—Dominion Minister Says Canada Is Ready

IN A STATEMENT made at Niagara Falls, Ontario, a few days ago, Paul A. Schoellkopf, president of the Niagara Falls (N. Y.) Power Company, said that a new treaty for additional diversion of power is now necessary. More than a million horsepower is now being generated on both sides of the river.

"All the power we are producing is in use," said Mr. Schoellkopf. "The 210,000 hp. being produced by the three new 70,000-hp. units put into service last year has been absorbed and we are not offering additional power for sale. The Canadian Niagara Power Company produces about 115,000 hp. No further hydro-electric power from Niagara Falls will be available to western New York until the treaty diversion limit is enlarged. Of course, that does not mean that additional power needs could not be met by means of steam-operated electric power plants, but until additional diversion permits additional development of hydro-electric power Niagara power from hydro-electric sources cannot be delivered to any further extent. The power from steam plants is much costlier than Niagara hydro-electric power. Additional power from now on can be supplied only at steam-power prices. We are meeting all present demands for power."

Delay in bringing the power treaty negotiations to completion has been largely due in the last few years to the failure of the Canadian government to act more promptly, Mr. Schoellkopf said. That was because Canada was not hard pressed for Niagara power as a consequence of the Ontario Hydro-Electric Power Commission's Chippawa-Queenston undertaking. Now, however, stringency of Niagara power is at hand on the Canadian side, and a real power shortage there looms not far ahead. In the Queenston power house of the Hydro-Electric Power Commission, opened two years ago, six big modern generating units are now in operation. The larger ones produce 55,000 hp. Together they produce over 300,000 hp. All this output, as well as the product of the commission's electrical generating plant near the Horseshoe Falls, has been absorbed. Two additional units, each of 55,000 hp. capacity, are now being built and will soon be in operation. Foundations are being laid for still another unit of similar capacity. So great is the demand for additional Hydro power in Canada, however, that another year will see this large additional load absorbed, according to the reckoning of power experts.

When shown a dispatch from Niagara Falls, Ontario, embodying the statement by Mr. Schoellkopf printed above, Charles Stewart, federal Minister of the Interior of Canada, denied that the Canadian government was holding up the negotiations. Mr. Stewart said that the Canadian government was ready at any time to discuss the question of further diversion at Niagara Falls, provided always that such diversion could be made without marring the scenic beauty of the Falls. He agreed that the time was approaching when more power would be required.

Wyer Thinks Thrice Present Diversion Won't Hurt Falls

More than three times the power now diverted from Niagara Falls can be taken without injury to their scenic beauty. This assertion is confidently made by Samuel S. Wyer, associate in mineral technology of the Smithsonian Institution at Washington, in a monograph just issued by him with the official indorsement of the institution.

The total amount of water flowing over the Canadian and American Falls together, Mr. Wyer says, is 205,000 cu.ft. per second. Of this amount, 56,000 cu.ft. is at present diverted for water power, 50,000 cu.ft. is needed for proper scenic effect and for sluicing ice over the falls in the spring, and 11,200 cu.ft. is diverted for the Chicago Drainage Canal, the New Welland Ship Canal and the New York State Barge Canal, leaving available for additional power development 87,800 cu.ft. per second, which could develop about 2,500,000 hp. in addition to the 1,000,000 hp. (approximate) now taken.

Underwood Bill Is Finally Passed

After Extraordinary Reversals and Parliamentary Gymnastics in the Senate, Bill to Lease Muscle Shoals Properties Goes to Lower House for Conference

AFTER six weeks of debate the United States Senate on January 14 disposed of Muscle Shoals legislation by adopting the Underwood proposal to lease the government's properties to private enterprise or, in the event of failure to secure a lessee, to place the properties in the hands of a corporation whose entire capital stock would be purchased by the government. The final vote on the Underwood substitute was fifty to thirty. Prior to the vote Senator Underwood had altered the fertilizer requirements of his bill, substituting therefor the Norris proposal to undertake work first on an experimental scale. It is believed, however, that the Underwood bill is still so drastic in its requirements as to make improbable any exercise of the opportunity offered private industry. It is predicted that the bill will be altered in conference so as to appeal more to those interested in leasing the properties.

The Senate's final action came only after spectacular and almost unprecedented parliamentary procedure. An amendment by Senator Wadsworth of New York proposing to refer the entire question to a commission with power to make final disposition of the properties was voted down overwhelmingly. The Senate then agreed by forty-six to thirty-three to the Jones amendment, which provided for the reference of the whole question to a commission to be composed of the Secretary of War, the Secretary of Agriculture and a third person to be appointed by the President. The amendment also authorized the construction of Dam No. 3. Senator Norris then proposed as a substitute for the Jones amendment his original bill. To the surprise of all concerned, including Senator Norris, the Senate, after having voted down the Norris proposal in committee of the whole, voted, forty to thirty-nine, for the Norris substitute. It was at this point that Senator Underwood inserted a new Section 4 in his bill and proposed it as a substitute for the Norris proposition. Senator Norris promptly made a point of order against the Underwood substitute. The point of order was not sustained, but Senator Norris appealed from the decision of the chair. Extended debate followed, but finally the Senate sustained the ruling of its presiding officer. In the meantime the Jones amendment was altered so as to provide for the reference of the entire question to a commission of five to be appointed by the President, the commission to report to Congress, which would take final action. This proposal was expected to appeal to the Senate as the best solution of the matter, but it was lost by forty-three to thirty-eight. Senator McKellar proposed the substitution of a modified Norris plan, but this proposal also was defeated.

The final vote on the Underwood measure seems to confirm the belief that it had the unqualified support of the administration, ten administration Senators who voted for the Jones amendment on Tuesday switching over to the Underwood bill on Wednesday. The legislation now is before the conferees of the two houses. It is thought probable that a compromise bill will be worked out in the conference committee, although the difference between the Underwood bill and the bill passed by the House last year, which favored the Ford offer, is very great.

Steam Operation Discussed

Chicago Session of Mechanical Engineers Debates Boiler and Turbine Problems

COMBUSTION control, air preheating, water-cooled furnace walls, oil engines, turbines and boiler-room and turbine-room auxiliaries were the outstanding subjects discussed at the two-day session of the American Society of Mechanical Engineers at the Hotel LaSalle, Chicago, January 14 and 15.

Arthur E. Grunert, Commonwealth Edison Company, pointed out differences in automatic control for large and small plants. If the control is connected with each individual boiler on a common header instead of with the header, many of the benefits of combustion control are lost, he said.

Experience with water-cooled furnace walls after a year's installation at the Hell Gate station in New York City was discussed by H. D. Savage of the Combustion Engineering Corporation. Using finned tubes on the side walls, no erosion of the tubes or reduction of efficiency through too much cooling of the furnace was discovered, despite the fact that ratings of 600 per cent had been obtained.

Alex D. Bailey, Commonwealth Edison Company, told of the rise in demand for water-cooled furnace walls. With the increase in fuel costs, coupled with the mounting expense of generating equipment, it is essential to secure the maximum output of equipment. This means operating at high ratings with the attendant punishment of refractories, which must withstand temperatures from 1,500 to 2,200 deg. F.

Francis Hodgkinson of the Westinghouse Electric & Manufacturing Company called attention to the advantages of the present practice of cross-compounding large turbine units, using the lowest possible rotative speeds and three-stage bleeding for feed-water heating. Particular attention is being given to blading design, a drop forging being used to give a blade with a warped surface. Rotor balance is being determined under conditions of resonance, and seasoning of rotors is being practiced. Attention is being given to design of exhaust passages and piping connection between units. Particular care is necessary in balancing strains on casing. Bleeding for regeneration is now held to be good practice. Most satisfactory results may be secured from compound machines by operating machines as units, but tied together electrically, giving the effect of a generator of large capacity and two or more windings. The best commercial turbine is a machine designed for maximum capacity at a given speed, and the lower the speeds practicable the better. Intrinsic value of a turbine increases with pressure, and the cost increases more slowly than the value. Reliability is now equal in importance with economy. European engineers consider 750 deg. F. as maximum temperature advisable with present-day materials.

H. E. Heaton of Sargent & Lundy favored end tightening of blades, closer limits for clearance, greater reliability and greater attention to the design of the casing and its attachments to prevent warping. Several others expressed a feeling that improvements in generator design are desirable and that lower speeds would help in this.

Great Edison Memorial Building at New York Is Proposed

A vast electrical office building, club and association center, to be erected on Fifth Avenue, New York City, as a tribute and memorial to Thomas A. Edison while he yet lives to see it, is the plan of Charles L. Eidlitz, chairman of the New York Electrical Board of Trade, as unfolded before a meeting of the Independent Associated Electrical Contractor-Dealers on January 14.

Mr. Eidlitz proposes a five-million-dollar twenty-story structure as the architectural setting for a heroic figure of Mr. Edison in bronze. Included in the building itself would be an auditorium seating a thousand persons, electrical display rooms, an electrical museum tracing the development of Mr. Edison's inventions, offices for local electrical bodies and a completely appointed club for electrical men with sleeping rooms, restaurants, etc.

At the close of Mr. Eidlitz' address the first bonds were subscribed to finance the proposed Edison Memorial.

Accident at Long Beach

Two Men Killed and Sixteen Hurt in Gas Explosion at Southern California Edison Plant

AN ACCUMULATION of gas in the firebox of a new boiler being tested in the addition to the Southern California Edison Company's Long Beach steam plant on Monday morning, January 12, caused an explosion which resulted in the death of two workmen and the injury of sixteen. Property damage was negligible. The explosion was in boiler No. 2, which was being made ready for a test, with about forty men working in the immediate vicinity. This boiler, one of eight in a battery, rated at 1,500 hp. each, was being heated slowly by means of a pilot torch. All the boilers are gas-fired. It is reported that for some reason not yet determined the pilot torch went out and considerable gas accumulated unnoticed in the firebox and around the boiler tubes. Noticing that the fire had gone out, an employee is said to have lighted a handful of waste, opened the firebox door and tossed it in. The explosion followed. Work in other parts of the plant was not interrupted, and the second turbine was put on test a few hours later. Stone & Webster have the building contract for the new unit.

N. E. L. A. Prize Awards Augmented

Three New Contests Inaugurated, H. M. Byllesby & Company, James H. McGraw and Arthur Williams Donating Annual Sums Aggregating $1,250

FROM the prize awards committee of the National Electric Light Association has just come the announcement that, in addition to the Henry L. Doherty gold medal, the Harriet Billings prize, the Frank W. Smith prize and the Martin W. Insull prize, established in 1910, 1912, 1921 and 1924 respectively, the association will this year and henceforth award seven additional annual prizes as follows:

A first prize of $250, a second prize of $150 and a third prize of $100 donated by the H. M. Byllesby Company, in memory of its late president, Henry M. Byllesby, for the best three papers on "Increasing the Usefulness of the Accountant to the Public Utility Industry."

A first prize of $250, a second prize of $150 and a third prize of $100 donated by James H. McGraw, president McGraw-Hill Company, Inc., for the best three papers on any technical subject relating to the electric light and power industry.

A prize of $250 donated by Arthur Williams, vice-president New York Edison Company, for the best paper on any commercial subject relating to the electric light and power industry.

Inasmuch as the Martin W. Insull prize of $250 is awarded for the best paper on public relations in the electric light and power industry, it will be seen that in each of the four sections of the N. E. L. A. there is now an annual contest open to employees of member companies. The Doherty medal is awarded for the best paper on any subject relating to the industry; the Harriet Billings prize of $50 (to be donated this year by W. C. L. Eglin, vice-president Philadelphia Electric Company) is for the second-best paper on any subject related to the industry, and the Frank W. Smith prize of $100 is for the employee of any member company who makes the most creditable showing in one of the association's educational courses.

The competing papers will be judged by the prize awards committee.

Brooklyn Edison Offers Prize

M. S. Sloan, president of the Brooklyn Edison Company, has offered a prize of $150 to the employee writing the best final chapter for the "Employees' Manual." Two other prizes will be given for the next best chapters. Many other electric light and power companies throughout the country also are offering prizes to employees for a final chapter of the manual to deal with local and individual questions.

Home-Lighting Contest for Central-Station Employees

The home-lighting contest for central-station employees already announced by the National Electric Light Association as under way will, it has been determined, have as prizes three sums—$500, $300 and $200—to be given by the association. Almost the same rules as those that were in force in the school children's contest will be employed. The main exception will be

the fact that the employees will not have to write an essay such as was required of the children. This will make the contest simpler and assure a greater number of contestants. Local contests must be held by companies between February 1 and March 15. Every employee of member companies conducting local contests is eligible. It is suggested by the association that the companies conducting these local contests give seven prizes ranging from $2 to $25 in value. The winning primer in each local contest is to be sent to N. E. L. A. headquarters for entry in the national contest. The essays must be sent to headquarters by April 15.

Governor of Indiana Attacks Holding Companies

In his address at the opening session of the Indiana State Legislature on January 8, Governor Jackson took occasion to advocate that the expense of valuation proceedings should be borne by the utility company affected whether or not it received authority to charge an increased rate. The present law puts this cost on the companies only when a rate is raised, and the Governor thinks this works an injustice to citizens not customers of the utility, who are taxed to meet the expenses. The Governor declared the Public Service Commission indispensable to the state. He attacked holding companies, saying:

"There is a growing tendency in this state to create holding companies by which what might be termed 'parent companies' hold stock in different utilities and make it very difficult for the Public Service Commission to find out the true status of affairs and fix a proper valuation for the purpose of making a rate. Therefore, I feel it might be worth while to suggest the propriety of mandatory legislation which would deny the right of any public utility to hold stock in any other public utility or the right of any corporation, if such corporation be a utility or a holding company, to hold stock in a public utility; that all holding companies be declared utilities."

Maine's Retiring Governor Opposes "Superpower"

Percival P. Baxter, the retiring Governor of Maine, in delivering a farewell message to his constituents, expressed himself in opposition to the North Atlantic "superpower" project, declaring it would benefit every State except Maine, which faced only an attempt to drain her natural resources. He enunciated two principles as to Maine water power, "first, the retention in Maine of the hydro-electric energy generated within the state, ard, second, the retention by the state of its ownership of its few remaining water resources."

He favored state development of water storage in lakes and reservoir basins and the sale of electrical energy generated on public power sites. He accused the water-power corporations of inconsistency in their propaganda and dismissed the phrase "public control" as "indulgence of corporations which want no control."

Robinson Enters Lists

General Electric Laboratory Engineer Nominated for Head of A. I. E. E.

A PETITION nominating Lewis T. Robinson, engineer in charge of the laboratory of the General Electric Company at Schenectady, N. Y., for president of the American Institute of Electrical Engineers has been filed. Together with the nomination of R. F. Schuchardt of the Commonwealth Edison Company, recorded in these columns last week, and that of C. E. Skinner of the Westinghouse Electric & Manufacturing Company, which dates from the Pasadena convention last fall, this makes three candidates now formally entered for the presidency of the Institute.

Born in Springfield, Mass., on October 20, 1869, Mr. Robinson was educated at Reading and Lynn in that state. His first connection with the electrical industry came soon after his graduation when charge of the standardizing laboratory of the Thomson-Houston company was intrusted to him. In 1891 he became a member of the testing firm of Whitmore & Robinson and in 1896 took charge of the standardizing laboratory of the General Electric Company. Later he was promoted to his present post of engineer in charge of the general engineering laboratory. During all this period Mr. Robinson has contributed largely to the engineering development of instruments and machines and has demonstrated his ability in executive supervision. Persistency, a sense of perspective, enthusiasm and an understanding of human psychology are traits freely attributed to him by those who are familiar with his work.

LEWIS T. ROBINSON

Mr. Robinson served as a vice-president of the A. I. E. E. in 1916-18 and 1920-21 and is a past-chairman of its standards committee. He is the author of important papers and is active in the National Electric Light Association. He is also a member of the United States national committee of the International Electrotechnical Commission and a member of the National Research Council.

Pacific Gas & Electric to Spend $17,800,000 in 1925

The Pacific Gas & Electric Company of San Francisco has planned a construction program calling for $33,721,000 for electric development and extension, of which amount $17,821,000 will be spent in the year just beginning. Early next July an addition to the great chain of hydro-electric developments on Pit River, to be known as Pit No. 3, will be in operation and add 1,000,000 kw.-hr. of electrical energy daily to the company's output, and before it goes into service work on Pit No. 4 will begin. This new plant will involve four miles of tunnel, a big diversion dam, a surge chamber, three penstock lines and a power house. It will take many months to complete the plant, but $2,500,000 of the $15,000,000 that it will cost will be spent in 1925.

In the Shasta division $905,000 will be spent for a new substation at Cottonwood and the lines that will bring in additional power from the California Oregon company. Substations at Red Bluff, Roseville and Livermore are to be reconstructed. Nearly a million and a half dollars will be spent in the East Bay district on Substations L and D and the Fiftieth Avenue substation in Oakland. In the Sacramento district Vaca-Dixon improvements, including the largest condenser ever installed in California, will cost $900,000. In San Francisco additions to the new Martin substation will take $660,000, and $236,000 will be devoted to converting the two-phase system into a three-phase system.

Thirty-five thousand new electrical customers are regarded as certain, and the number may run far higher.

Premier of Quebec Will Fight Power Exportation

Premier L. A. Taschereau of the Province of Quebec, whose determined opposition to the exportation of power from that province to the United States was reported in the ELECTRICAL WORLD for January 3 (page 64), reiterated his views before the Quebec Legislative Assembly on January 12. He said that the province would fight to the limit any effort on the part of the Dominion government to export hydro-electric power and that any contracts entered into to this end would be made at the risk of the contracting parties. Premier Taschereau again suggested that United States interests establish their plants in Quebec and thus avoid future complications. He said, referring to disputed jurisdiction as between the Dominion and the provincial governments:

"Should means be found of exporting power despite us, nothing would prevent us from exacting a royalty sufficiently high to make that commerce unremunerative, even without taking into account the fact that expropriations and right-of-way are matters which require our approval."

Colorado Basin Surveys

Stream Courses Mapped by Geological Survey Covering About Two Thousand Miles

ONE of the largest and most hazardous projects undertaken by the Department of the Interior through the Geological Survey has been that of mapping Colorado River and its tributaries. From time to time since 1869, when Major J. W. Powell, afterward director of the Geological Survey, first explored the Grand Canyon of the Colorado, topographers, engineers and geologists of the Survey have been making surveys in parts of the 244,000 square miles drained by the river. Systematic surveys for a series of large-scale maps of the river and the adjacent areas were begun in 1909, and the field work required for these maps is now practically completed. Much of this field work was hazardous and the surveying parties at times suffered great hardships.

Today the maps prepared and the information collected by the Geological Survey furnish an accurate knowledge of nearly 2,000 miles of the watercourses in this basin, showing every turn of every stream, the location and the fall of all the rapids, the topography and geology of the canyon walls and the location and cross-sections of the more feasible dam sites.

Some of these maps have been included in books; others are published separately, in sets. The Geological Survey's "Water-Supply Paper 396," entitled "Profile Surveys in the Colorado River Basin in Wyoming, Utah, Colorado and New Mexico," contains forty-three maps showing plans and profiles of the Colorado above Green River, of Green River and its tributaries and of a part of Gila River. The more recent maps are printed in three colors—black, blue and brown—used respectively for the geographic names, the rivers and the levels in the region, and represent the highest type of river survey maps. The following maps have already been published: Green River from Green River, Utah, to Green River, Wyo., comprising sixteen sheets; Colorado River from Lee's Ferry, Ariz., to the mouth of Green River, Utah, and San Juan River to Chinlee Creek, Utah, comprising twenty-two sheets. Other maps now in press or in course of preparation are: Yampa River from Green River to Morgan Gulch, Col., five sheets; Colorado River from Lee's Ferry, Ariz., to Black Canyon, Ariz.-Nev., and Virgin River, twenty-one sheets; Colorado River from Black Canyon to the Mexican boundary. These maps are sold for 10 cents each.

Industrial-Heating Lectures Sponsored in Chicago

To familiarize their customers and the manufacturers of the Chicago district with the possibilities of electricity as a source of heat, the Commonwealth Edison Company and the Public Service Company of Northern Illinois are arranging a series of lectures on electrical industrial heating. The meetings, which will be held in the hall of the Western Society of Engineers on the afternoons of January 23, January 30 and February 6, will be open to all interested. The subjects will include the heat-treating of steel, melting of ferrous and non-ferrous metals, japanning, vitreous enameling and miscellaneous industrial applications. The lectures will be given by engineers of national repute. These lectures were originally prepared for the power sales engineers of these two companies, but were rearranged to be of value to power users as well. No broadcast advertising will be used to announce these meetings. Instead a post card will be sent each power customer and prospective customer inviting their attendance.

The tentative program of lectures includes the following subjects and speakers: "Co-operation of the Central Station," A. J. Wager; "Where the Electric Furnace Is Economically Right," R. F. Benzinger; "Special Low-Temperature Applications for Industrial Processes," W. S. Scott; "Standard Box-Type Heat-Treating Furnaces and Electric Vitreous Enameling," C. L. Ipson; "Electric Arc-Melting Furnaces," W. B. Wallis; "Electric Japanning, Drying and Core-Baking Ovens," Thomas McVicker; "Solving Production Problems with Continuous and Automatic Electric Furnaces," W. L. Smalley, and a talk by Prof. C. F. Hirshfeld, Detroit Edison Company.

Many Projects Come Before Commission

Federal Power Board Deals with Hydro-Electric Enterprises Seeking Authorization—Trinity and Mokelumne Among California Streams Concerned

THE Federal Power Commission has authorized the issuance of a preliminary permit to W. H. Samson of Corning, Cal., covering a comprehensive water-power and irrigation development in the Trinity River and tributaries and in the Sacramento Valley in Trinity and Shasta Counties. The proposed development involves the construction on Stuart's Fork of four storage reservoirs having a total capacity of 20,000 acre-feet. Four power houses with an aggregate capacity of 20,000 hp. are to be constructed. It is proposed a construct a dam across the Trinity one mile below Stuart's Fork, which will create an additional reservoir of 600,000 acre-feet capacity. Power house No. 5 is to be erected at this dam with an installed capacity of 16,700 hp. The plan is to divert the water from the tailrace of this power house through the Trinity-Sacramento Divide to power house No. 6, on Clear Creek, which is to have an installed capacity of 40,000 hp. A storage dam is to be erected in Clear Creek and the water taken from there to power house No. 7, where it is proposed to install 55,000 hp. Power house No. 7 is to be built on the Sacramento River 3 miles west of Reading. The water from that tailrace will flow into the Sacramento and be used for irrigation at points below. The primary power which will thus become available will aggregate 125,000 hp. The commission inserted in the permit a condition that a flow of at least 20 cu.ft. per second must be maintained in the Trinity River below the point of diversion.

An extension of one year has been authorized by the commission for the following preliminary permits: Crocker and Preston, Mokelumne River, Cal.; California Oregon Power Company, Klamath River, Ore.; Louisville Hydro-Electric Company, Ohio River; Ralph Bennett, Big Rock Creek, Cal.

LICENSES ISSUED AND CANCELED

The commission has authorized the issuance of a license to the Cyanide Gold Mining Company of Idaho covering a development under construction on the Moyis River. The capacity of the project is 653 hp., intended for the use of the mining company. A license also has been authorized for the Sovereign-Comet Gold Mining Company of Downieville, Cal., covering a development in Jim Crow Creek in Sierra County. It is proposed to construct a dam in Jim Crow Creek to divert water through a conduit 2 miles long to the power house.

An extension of the construction period in the license of Hutton, McNear & Doherty of San Francisco until June 30, 1928, has been approved by the commission. Because of failure to comply with the conditions of its license, the rights granted the Alaskan-American Paper Corporation on October 14, 1921, have been canceled. Construction was to have begun on or before August 31, 1922. Recent advices from the Forest Service are to the effect that no construction work has been done.

A license issued the Little Rock Power & Water Company covering a project on Little Rock Creek in California set December 1, 1922, as the date for beginning construction work. On being advised that no construction work has been done, the commission terminated the license. A license issued R. Colwell for a minor project on McKinney Creek in California has also been rescinded.

JURISDICTION TAKEN AND DECLINED

The Flambeau River Improvement Company has filed declaration of intention proposing the construction of a dam in the North Fork of the Flambeau River in Wisconsin. The commission finds that the development does not come within its jurisdiction.

The Interstate Power Company of South Carolina has declared its intention to construct a dam in the Savannah River at Middleton Shoals. In this instance the commission has taken jurisdiction.

The Lawrence Hydro-Electric Company and the Connequenessing Power Company have declared their intention of constructing a series of six dams in Slippery Rock and Connequenessing Creeks in Lawrence County, Pa. The interests of interstate and foreign com-

merce will not be affected and the commission will therefore not take jurisdiction.

Z. R. Moye of Meeks, Ga., has declared his intention to construct a dam in Big Choopse River in Johnson County, Ga.; Sam M. Clark of Conway, Ark., has declared his intention to construct a dam in the North Fork of Cadron Creek in Arkansas, and M. L. Culley of Jackson, Miss., has declared his intention to construct two dams in Strong River in Simpson County, Miss. The commission finds that none of these developments comes within its jurisdiction.

California Municipal Project

The East Bay Municipal Utility District, of which George C. Pardee of Oakland, Cal., is president, has filed an application with the commission for a preliminary permit covering a development on Mokelumne River in Amador and Calaveras Counties, Cal. It is proposed to erect a dam 320 ft. high below the mouth of Salt Gulch. This will create a reservoir with a capacity of 187,000 acre-feet. It will be operated in connection with a 220,000-acre-foot reservoir to be formed by an 85-ft. dam on Dry Creek, 7 miles below Ione, which is not included in this application. The principal purpose of the reservoir is to provide a water supply for the East Bay cities, but there will be incidental development of power. A power house will be erected at the dam with equipment capable of generating 18,000 hp.

The commission has fixed $3,147,501 as the fair value, as of May 31, 1923, of the Borel plant of the Southern California Edison Company on Kern River. The company has agreed to that valuation, and it will be made a part of the license which will be issued to cover the project.

Permits and Licenses Sought

A dam 129 ft. high across Black River near Piedmont, Mo., is proposed in an application by Willis H. Meredith for a preliminary permit. The power is intended for general sale.

A development on Rio Blanco, in the municipality of Naguaba, in Porto Rico, is proposed in a preliminary permit sought by Arsine L. Arpin. It is proposed to divert four tributaries to a point near their junction with the Rio Blanco. One power house is to be built at that point. A second power house is planned for the foot of the cascades. A total head of 1,900 ft. is obtainable and 5,600 hp. will be installed. The development is within the Luquillo national forest.

A license to develop power on Deep Creek, a tributary of the Mojave River in San Bernardino County, Cal., near Hesperia, is sought by the Appleton Land, Water & Power Company. It is proposed to create a reservoir of 1,000 acre-feet capacity. A conduit will carry the water to the power house near the intake of the Hesperia ditch. About 2,000 hp. will thus be made available.

A license covering a 200-hp. development on Stratton Creek in Valley County, Idaho, has been sought by the Bunker Hill & Sullivan Mining & Concentrating Company.

Inductive Co-ordination

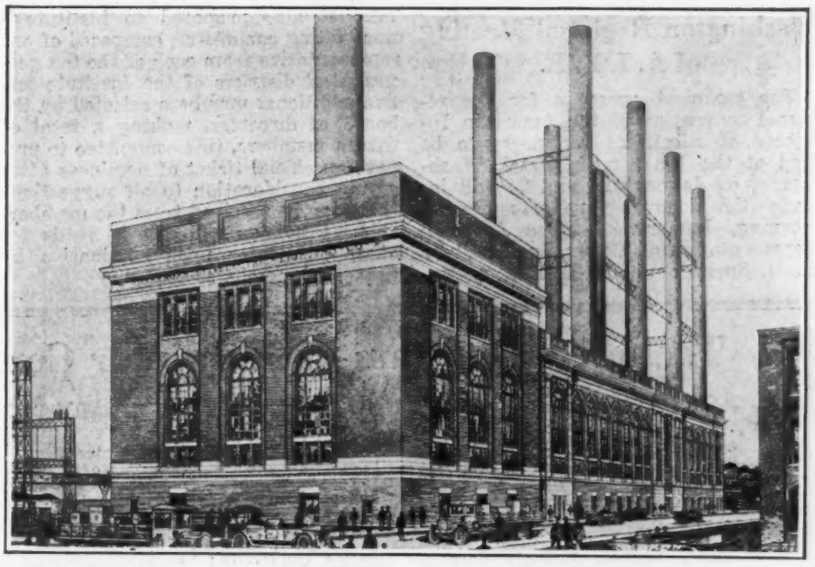
Joint Committee, Representing Four Groups, Issues Preliminary Report

REPORT No. 1 of the American Committee on Inductive Co-ordination has just been issued. This committee, which represents four groups of interests — electric light and power companies, electric railways, steam and electrified railroads, and telephone and telegraph companies—has for its objects, as most readers of the ELECTRICAL WORLD are no doubt aware:

(1) To collect and make accessible to all interested organizations all available information on the subject of the inductive co-ordination of electrical systems; (2) to keep in touch with all co-operative work being done by the various organizations on the subject of inductive co-ordination and to provide a means whereby the results of such work may be co-ordinated in so far as necessary and practicable to make it generally useful to all organizations concerned; (3) to assist in the avoidance of unnecessary duplication of work by promoting as may seem to it desirable the joint co-operative work already undertaken; (4) to assist in the organization of such additional co-operative work as may from time to time appear necessary or desirable; (5) to undertake such additional work on this subject as may seem to it desirable.

This preliminary report covers the organization, scope and personnel of the committee and contains its bylaws and the report of its program committee, which is in the nature of a plan to carry out through sub-committees the objects just stated. The active members of the committee from the electric light and power group are: M. R. Bump of New York, H. L. Wills of Atlanta, W. J. Canada of the National Electric Light Association, A. E. Silver of New York, R. N. Conwell of Newark and H. B. Gear of Chicago, with R. F. Pack of Minneapolis, W. V. Lovell of New York, J. G. Hemstreet of Jackson, Mich.; J. E. Woodbridge of San Francisco, H. S. Phelps of Philadelphia and Alexander Maxwell of the

Narragansett Steam Plant to Include New Features



REMODELING of the South Street station of the Narragansett Electric Lighting Company, Providence, R. I., will embrace a number of new features of design, according to a recent announcement. Jenks & Ballou, consulting engineers, Providence, are in charge of the engineering and supervisory work. The redevelopment of this station is proceeding along lines planned to give the company first-hand knowledge and experience for the later design of a new base-load station. Four 1,850-hp. boilers will be installed, and these will be equipped with water screens in the proportion of more than twice the percentage of any previous boiler installation. If these screens meet expectations, the boilers may normally deliver an output of from 4,000 hp. to 6,000 hp. each. Provision is being made to add future tubes to the superheater in case the screens prove extremely successful.

The fuel will be powdered coal, to be prepared in a separate building costing equipped about $330,000. The air supply to the furnaces will be preheated and the water-screen installation will have a special steam drum to permit measurement of the output of the screens. An elaborate set of weighing bins will be provided to enable the boiler efficiency to be checked for test or routine operation purposes. Two cinder-vane fans will also be tried in connection with the induced-draft system. The boiler house is being extended and the company's 66,000-volt switching station relocated.

The contracts for the boilers has been awarded to the Babcock & Wilcox Company, that for the pulverized-fuel equipment to the Combustion Engineering Corporation, and, as previously stated, the General Electric Company has received a contract for a 43,500-kva. turbo-generating unit. The operating steam pressure will be 385 lb. at 200 deg. superheat, and it is hoped to have the plant's enlarged section in service by November of this year.

N. E. L. A. as alternates. Bancroft Gherardi of the telegraph and telephone group is chairman, M. R. Bump, C. R. Harte of the electric railway group and E. B. Katte of the steam railroad group vice-chairmen, and G. C. Hecker, secretary.

Consolidated of Baltimore Will Spend $7,700,000

New projects included in the construction budget for 1925 of the Consolidated Gas, Electric Light & Power Company of Baltimore call for an expenditure of $7,733,350. This makes a total of $55,026,510 required for expansions and improvements to the properties of the Consolidated company since the present management assumed control in 1910. Between December 1, 1923, and December 1, 1924, the company was called on to supply electric service to 16,520 new customers, increasing the number of electric customers from 124,545 to 140,065. The number of new electric customers during this period was about as many as the total number of electrical customers in 1910.

Washington Regional Meeting of A. I. E. E.

The technical program for the regional convention of the American Institute of Electrical Engineers to be held at the Washington Hotel, Washington, on January 23 and 24 will include the following papers: Friday morning, January 23: "The Artificial Representation of Power Systems," by H. H. Spencer and H. L. Hazen, General Electric Company; "Theory of the Autovalve Arrester," by Joseph Slepian, Westinghouse Electric & Manufacturing Company. Friday afternoon: "The Economics of Raising Power Factor," by L. W. W. Morrow, ELECTRICAL WORLD; "Interconnection of System with Frequency Changers," by H. R. Woodrow, Brooklyn Edison Company. Saturday morning: "The Thermal Time Constants of Electrical Machines," by A. E. Kennelly, Harvard University; "The Work of the Committee on Electrical Insulation," by J. B. Whitehead, Johns Hopkins University.

On Friday evening there will be a dinner at which Secretary Hoover will make an address

A. I. E. E. Has Constitutional Changes in Contemplation

At the recent meeting of the board of directors of the American Institute of Electrical Engineers the special committee on election procedure appointed in the spring of 1924 submitted a report recommending that after this year only one ballot be sent out to the membership instead of, as in the past, a nomination ballot and later an election ballot. It also proposed to institute a nominating committee, composed of one representative from each of the ten geographical districts of the Institute and five additional members selected by the board of directors, making a total of fifteen members, this committee to prepare an official ticket of nominees after giving consideration to all suggestions that may be received from the membership. Provision will also be made for other candidates upon nomination by groups of members.

This report was referred for consideration to a committee on revision of the constitution which the president was authorized to appoint and whose members are L. F. Morehouse (chairman), G. L. Knight, W. I. Slichter, H. B. Smith, and W. K. Vanderpoel.

Three applicants were elected to the grade of member at the directors' meeting, five applicants were transferred to the grade of member, and 102 applicants were elected associates.

February Institute Meeting

Papers Cover Machinery, Electrophysics, Transmission and Other Topics

SESSIONS on electrical machinery, electrophysics, instruments and measurements, and communication and transmission have been scheduled for the midwinter convention of the American Institute of Electrical Engineers, to be held at the Engineering Societies Building, New York City, on February 9 to 12. In addition, there will be one good paper each on storage batteries and central-station statistics.

The social side of the program includes a smoker with entertainment on Monday evening, February 9; a lecture on aircraft in war by Major-General M. M. Patrick, President Osgood presiding, and the presentation of the Edison medal to this year's medalist, John W. Howell, by John W. Lieb, on Wednesday evening, and on Thursday evening the dinner-dance which always closes the New York convention. This will be given as formerly at the Hotel Astor. Trips to points of engineering interest will be arranged for Wednesday afternoon for those desiring to take them.

Technical Program of Midwinter Convention A. I. E. E.

NEW YORK CITY, FEBRUARY 9-12

MONDAY, FEBRUARY 9

(Under auspices of committee on electrical machinery, H. M. Hobart chairman)

Afternoon.—"A New Alternating-Current General-Purpose Motor," H. Weichsel, Wagner Electric Corporation; "Alternating-Current Commutator-Motor Design," L. W. Perkins, Westinghouse Electric & Manufacturing Company; "The Effect of Full-Voltage Starting on Induction Motors," J. L. Rylander, Westinghouse Electric & Manufacturing Company; "Another Form of Self-Excited Synchronous Induction Motor," Val A. Fynn, consulting engineer.

TUESDAY, FEBRUARY 10

(Under auspices of committee on power transmission and distribution, P. H. Thomas chairman.)

Morning.—"The Artificial Representation of Power Systems," H. H. Spencer and H. L. Hazen, General Electric Company; "Power-System Transients," V. Bush and R. D. Booth, both of Jackson & Moreland; "Testing Impregnated-Paper-Insulated, "Lead-Covered Cables," Everett S. Lee, General Electric Company; "Predicting Central-Station Demands and Outputs," F. C. Ralston, Philadelphia Electric Company.

(Under auspices of committee on electrical machinery, H. M. Hobart chairman.)

Afternoon.—"The Thermal Time Constants of Electrical Machines," A. E. Kennelly, Harvard University; "Squirrel-Cage Induction-Motor Core Losses," Thomas Spooner, Westinghouse Electric & Manufacturing Company; "Complete Synchronous-Motor Characteristics," J. F. H. Douglas, E. D. Engeset and R. H. Jones, Marquette University; "Factors Affecting the Design of Direct-Current Motors for Locomotives," R. E. Ferris, Westinghouse Electric & Manufacturing Company.

WEDNESDAY, FEBRUARY 11

(Under auspices of committee on electrophysics, J. H. Morecroft chairman.)

Morning.—"Study of Direct-Current Corona in Various Gases," F. W. Lee and B. Kurrelmeyer, both of Johns Hopkins University; "Effect of Repeated Voltage Application on Fibrous Insulation," F. M. Clark, General Electric Company; "Corona in Oils," A. C. Crago and J. K. Hodnette, Westinghouse Electric & Manufacturing Company; "Stresses in Bus Supports During Short Circuits," O. R. Schurig and M. F. Sayre, General Electric Company.

Afternoon.—Trips to various points of engineering interest in the vicinity of New York.

Evening.—Presentation of Edison medal to John W. Howell, by John W. Lieb, vice-president New York Edison Company; lecture by Major-General Mason M. Patrick, chief of the Air Service, U. S. A., on the use of aircraft in war.

THURSDAY, FEBRUARY 12

(Under auspices of committee on instruments and measurements, A. E. Knowlton chairman.)

Morning.—"Electrical Measurements of Physical Values," Perry A. Borden, Hydro-Electric Power Commission of Ontario; "Use of the Oscillograph to Measure Mechanical Phenomena," Harvey L. Curtis, Bureau of Standards; "Temperature Errors in Induction Watt-Hour Meters," I. F. Kinnard and H. J. Faus, General Electric Company; "Storage-Battery Electrolytes," G. W. Vinal, Bureau of Standards.

(Under auspices of committee on communication, O. B. Blackwell chairman.)

Afternoon.—"The Theory of Probability and Some Applications to Engineering Problems," E. C. Molina, American Telephone & Telegraph Company; "The Design of Distortionless Power Amplifiers," E. W. Kellogg, General Electric Company; "Metallic Polar-Duplex Telegraph System for Long Small-Gage Cables," J. H. Bell, Western Electric Company, and R. B. Shanck and D. E. Branson, both of American Telephone & Telegraph Company; "Voice-Frequency Carrier Telegraph Systems for Cables," B. P. Hamilton and H. Nyquist, both of American Telephone & Telegraph Company, and M. B. Long and W. A. Phelps, both of Western Electric Company; "Polarized Telegraph Relays," J. R. Fry, Western Electric Company, and L. A. Gardner, A. T. & T. Company.

Rating of Rivers

Memorandum by Geological Survey Concerning Standardization of Methods

A MEMORANDUM issued by the United States Geological Survey refers to the insistent and increasing demand for information in regard to the capacity of rivers for generating power. Statements are prepared daily, the Survey says, treating of some river or particular site in which capacity is discussed. With the rapid increase in use of power, amounting for public utility companies during the last five years to 10 per cent compounded annually, there is increasing interest on the part of engineers, financiers, publishers and the public in the sources of energy that are practicable of utilization. There will be therefore a continuing demand for information and necessity for statements of the power capacity of rivers.

"Statements of capacity," the memorandum continues, "are now made on many different bases, varying with the ideas of individuals, the custom of the region, the nature of the market to be served and in some instances the desire to make the capacity appear large. The stated capacity for the same site may therefore vary several hundred per cent, ranging from a minimum of twenty-four-hour delivered power available in the day of lowest flow to ten-hour power (obtained by using pondage) available six months in each year, or even to the capacity of waterwheels that may be installed profitably to supply energy in a market that can use large quantities of non-primary power. The public, including many people who should understand the reasons for these differences, is confused by the apparently conflicting statements, leading to doubts as to the reliability of the data or even the honesty of the presentation of information about capacity of power sites for which the fundamental facts are completely established.

"The statements of power capacity emanate from several bureaus of federal and state governments, from public utility commissions and other regulatory bodies and from civil, electrical and mechanical engineers and engineering organizations engaged in commercial work. There is no good reason why statements from all these sources should not be comparable if there is agreement on the basis of rating. Such a standard basis for stating power capacity appears to be in the interest of all and to be entirely practicable of adoption and application."

STANDARDS COMMITTEE READY TO HELP

In furtherance of the Geological Survey's desire to promote standardization, the American Engineering Standards Committee has distributed a questionnaire to engineers and others concerned which reads as follows:

The United States Geological Survey has proposed that there be national standardization of methods of rating rivers.

1. In your opinion is the time ripe for this work, and is it desirable that it be undertaken?
2. If so, is the following satisfactory as a brief outline for the scope of the work: "Standardization of methods of rating the capacities of rivers for producing water power in order that statements of available power may be made on comparable bases."
3. And, if so, should the work be carried out by a sectional committee organized under the procedure of the A. E. S. C.? (Note.—Such a sectional committee would probably contain from twenty to thirty-five men designated by the interested organizations, primarily the national engineering and trade associations and government departments interested.)
4. Is it desirable that international cooperation be sought through contact with other national standardizing bodies?
5. Are there any special points in regard to the matter which you wish to put before the A. E. S. C. or make available to the sectional committee at this time?

Program of Indiana Utilities Association Convention

More than five hundred executives of utility companies are expected to attend the meeting of the Indiana Public Utilities Association to be held in Indianapolis January 22. The business sessions will be addressed by William H. Hodge of Chicago, president of the Public Utilities Advertising Association, on "Uses of Advertising by Utilities"; Miss Mae Fletemeyer of Hammond, Ind., on "Women and Public Utilities," and W. S. Vivian of Chicago, on "Public Relations of Utility Companies." At the annual banquet in the evening Major-General George H. Harries of Chicago will speak on "Our Obligations as Citizens." Lieutenant-Governor F. H. Van Orman will be the chief speaker at the annual luncheon of the association.

For the same day A. E. Scott, chairman, has called a meeting of the public relations committee of the Indiana Electric Light Association, and Roy Thurman of Muncie, Ind., chairman of the public speaking committee of the same organization, has called a meeting of his group. Harry Reid, president of the Interstate Public Service Company, has called meetings of his managers and members of the women's public information committee. Managers of the Northern Indiana Power Company and the Wabash Valley Electric Company also will hold meetings.

Texas Lignite to Be Burned at New Braunfels Plant

Texas lignite coal in powdered form will be burned under the boilers of the San Antonio Public Service Company's new plant when it is erected this year. This plant was alluded to in the ELECTRICAL WORLD for December 27, page 1378, and in the previous issue, page 1327, was an account of the projected plant of the Texas Public Utilities Company to be built near Trinidad, which also will burn Texas lignite.

Fuel of this kind from a large bed in southwestern Texas was shipped to Minnesota to be used in powdered form in experiments made by the St. Paul Gas Light Company in a recently completed plant. Concerning the results of this experiment E. H. Kifer, vice-president and general manager of the San Antonio Public Service Company, said recently:

"The test was made under adverse conditions, but in spite of this I was convinced of its practicability. In transit to St. Paul the coal was exposed to unusually inclement weather, being rained and snowed on almost the entire distance.

"Although lignite coal has only about one-half the heating value of a higher grade of coal, the test conducted in St. Paul developed no mechanical troubles and cared for overloads nicely. We have satisfied ourselves as to its availability as a basic fuel and shall construct our new plant with a view to using lignite from southwest Texas fields. Should we decide at any time to change over to oil or gas, it will not be necessary to make any alterations in our plant. Under the old stoker system we could not substitute either of these three fuels for coal."

A high-tension transmission line will be built from the new plant to San Antonio, 35 miles.

Briefer News

Massachusetts Central Stations Enlarge Office Quarters. — The Lynn (Mass.) Gas & Electric Company will shortly expend about $100,000 in enlarging its headquarters offices, and the Cape & Vineyard Electric Company will transfer its main offices from Falmouth to Hyannis and erect a two-story brick structure on the site of its present district office in Hyannis.

Work About to Begin on Big Selinsgrove Plant.—Work is expected to begin early in January on the seven-million-dollar plant which the Pennsylvania Power & Light Company is to build at Shamokin Dam, near Selinsgrove, and opposite Sunbury, Pa. The Reading and Pennsylvania railroads will build sidings to the site, on which 750 men will be employed in construction work.

Chippewa Falls Still Thinks of Municipal Plant. — Agitation has again started in the Common Council of Chippewa Falls, Wis., for the purchase of a dam site on the Chippewa River from the Northern States Power Company for the erection of a municipal dam and power plant. The purchase would also include the company's electric distributing system. The idea behind the agitation is that of generating cheap electricity and an inducement to manufacturing firms to locate at Chippewa Falls.

President Osgood Addresses Atlanta Engineers. — On Friday, January 2, Farley Osgood, president of the American Institute of Electrical Engineers, spoke before the Atlanta Section of the A. I. E. E. The occasion was a dinner meeting at the Biltmore Hotel, to which the associated technical societies in Atlanta were invited, and one hundred attended. Chairman Rawson Collier presided. Mr. Osgood's subject was "The Position an Engineer Should Assume in His Community."

Tugalo and Tallulah River Plants.— The new developments of the Georgia Railway & Power Company on the Tugalo and Tallulah Rivers have furnished the material for a handsome illustrated folder, published as a supplement to the house organ of that

company, in which striking views of the dams, lakes and penstocks are included. On these developments, aggregating more than 200,000 hp., the company has, it says, spent more money than has been spent in the whole history of Georgia on any other one enterprise, excepting only the steam railroads.

Grand Forks, N. D., Red River Project.—Bills to give the city of Grand Forks, N. D., authority to dam the Red River of the North will be introduced at the coming sessions of the Minnesota and South Dakota Legislatures. A bond issue for this project has been carried in Grand Forks, but state approval is necessary before a permit can be obtained from the Federal Power Commission.

Ontario Farmers Want Power at Uniform Cost Regardless of Transmission Distance.—According to a unanimous opinion expressed at a meeting of the Dominion Grange recently held in Toronto, present methods of distributing electrical energy throughout the Province of Ontario are "fundamentally wrong." A resolution was adopted calling for "thorough reconsideration of the whole system of electrical distribution, in order that power may be furnished to all parts of the province at the same cost." The accident of geographical location, it was contended, should not militate against general enjoyment of the same advantages from cheap power.

Ontario Hydro Moves Against Electric House Heating.—The Hydro-Electric Power Commission of Ontario has abandoned the sale of electric heaters and is taking steps to reduce to a minimum the heating of houses by electricity. The Hydro shops have ceased stocking electric heaters and electric grates. The claim is advanced that these heaters put a purely seasonal demand on the system, making the consumption top-heavy in winter. Simultaneously with the dropping of heaters, the Hydro is putting what consumers assert to be a prohibitive rate on house heating by electricity. This rate is said to have been ordered by Sir Adam Beck nearly a year ago, but is only now going into force.

Pacific Gas & Electric Company Asks Increase in Wholesale Rates.—Application has been filed with the California Railroad Commission by the Pacific Gas & Electric Company for an increase in wholesale rates on the ground that municipalities and other utilities have been purchasing power at 20 per cent below cost. With a total gross sale of power for resale of $1,750,000 in 1924, the company contends that a loss of $400,000 was entailed. Five small towns having municipal distribution systems and seven small utilities purchase power at wholesale. The rates paid for such power range from 8 mills to 2 cents a kilowatt-hour. A general increase in the schedule is requested by the company.

Pacific Gas & Electric Buys 14,000 Acres of Land in Fall River Valley, Cal.—What is said to be the largest land deal ever completed in Shasta County, Cal., was closed at Redding recently by the payment of $300,000 for 14,000 acres of land in Fall River Valley. The land was sold to the Pacific Gas & Electric Company. By this purchase the power company ends a long series of litigations over water rights. Fall River is famous for its steady flow. Owing, it is believed, to the existence of an underground stream, it never rises in winter more than a few inches, no matter how heavy the rains, and never falls in summer, regardless of dry weather.

How Interconnection Between Seattle and Tacoma Is Working.—In a recent report to the Seattle City Council Superintendent of Light J. D. Ross says that with the Skagit furnishing from 35,000 hp. to 45,000 hp. steadily the city not only has sufficient power for its own needs but is able to furnish needed power to the neighboring city of Tacoma. Through the tie line constructed two years ago Seattle furnished Tacoma with $11,655 worth of Skagit energy during November at the contract price of 0.5 cent per kilowatt. Seattle will continue to furnish this service during the winter, when needed. Last summer, on the other hand, Seattle paid a bill of $24,090 for energy purchased from Tacoma in order to escape the use of the more costly steam-generated electricity from the Lake Union steam plant, and this transaction will probably be repeated next summer during the period of low production at the Skagit.

Program of Western Electric Inspectors.—Committee reports will fill the first two days of the twentieth annual meeting of the Western Association of Electrical Inspectors, to be held at Louisville on January 27, 28 and 29. On the third day the "State Electrical Code" will be the subject of discussion. The viewpoint of the state will be presented by John A. Hoeveler, electrical engineer with the Wisconsin Industrial Commission; the viewpoint of the manufacturer of electrical materials and fittings by C. A. Bates, Bryant Electric Company, Bridgeport, Conn.; the viewpoint of the electrical contractor by A. Penn Denton of Kansas City, and the viewpoints of the public service company and the public by speakers to be selected.

Appalachian Power Building New Lines to Aid Interconnection.—The Appalachian Power Company, whose headquarters are at Bluefield, W. Va., is soon to build a double-circuit steel-tower transmission line from its 60,000-kw. station at Glenlyn, Va., to Roanoke. A similar line, making total new high-tension construction of about 100 miles, will be built from Roanoke to Lynchburg by the American Electric Power Company, in which the Appalachian Power Company has a financial interest, and power will be supplied by the Appalachian. This will give Lynchburg and Roanoke an adequate supply of electricity to meet their growing industrial needs. The Glenlyn plant is already interconnected with hydro-electric stations having a rating of 28,000 kw. In addition, transmission lines are now under construction which will tie the Appalachian Power Company in with the Kentucky & West Virginia Power Company. This company is in turn connected with large stations in northern West Virginia and Ohio. A survey is also under way for a line from Roanoke to Danville and Martinsville.

Details of White and Wabash River Projects.—The tentative plans adopted for the projected 17,000-hp. hydro-electric plants on the White River in Dubois and Martin Counties, Ind., and at Grand Rapids, Ind., on the Wabash River, near Mount Carmel, Ill., have been made public by John A. Shafer of Indianapolis. Mr. Shafer plans to build a 12,000-hp. plant on the East Fork of the White River and build dams at Hindustan Falls and near Haysville. In addition a power house with an installed capacity of 4,800 hp. is proposed at the United States lock and dam at Grand Rapids. It is planned to sell energy to utilities already established in southern Indiana for transmission over private lines to Washington, Shoals, Loogootee, French Lick and other towns in that region and to residents of the rural districts. In the first announcement of these plants in this column the total rating was erroneously put at 170,000 hp.

Exchequer Power-Plant Contracts Let.—Prime-mover and generator equipment for the Exchequer hydro-electric plant of the Merced Irrigation District were recently placed on order. This plant is on the Merced River, 35 miles east of Merced, Cal., and will contain two 24,500-hp. vertical-reaction turbines driving directly connected 15,000-kva. generators. Because of the fact that irrigation will take precedence of power in the Exchequer development, the turbines will be designed to provide best efficiency under heads ranging from 300 ft. maximum to 140 ft. minimum. In normal years the reservoir will provide enough storage to run the plant at full capacity for five months. After the head has reached the minimum the plant will be shut down. The power will be stepped up to 120 kv. and tied in through a transmission line with the system of the San Joaquin Light & Power Corporation, which will absorb the entire output of the plant.

Electrical Men Help Form Signal Association.—The military and civilian interests concerned in telephonic and telegraphic communication, including manufacturers of equipment, are co-operating in perfecting a national organization known as the American Signal Corps Association. The object is to promote a better understanding of the problems of preparation and operation of military communication through establishing a closer relation with those who will produce, prepare or operate these systems either as civilians or as members of the military forces. The association will include in its membership officers, engineers of both telephone and power companies interested in Signal Corps work and civilians who are concerned with the manufacture or operation of communication equipment. Local posts have already been organized in Chicago, New York, Boston, Washington and Houston.

Mitchell, S. D., Grants Central-Station Franchise.—Mitchell, S. D., has just granted by special election a twenty-year electric and gas franchise to the Northwest Public Service Company, which purchased the Mitchell Power Company last spring. Mitchell has a population of about nine thousand.

Georgia Utilities Information Committee Elects Officers.—At a meeting of the Utilities Information Committee of Georgia on January 5 L. A. Magraw, vice-president of the Central Georgia Power Company of Macon, was elected chairman. Willard Cope, executive secretary of the committee, was elected vice-chairman. Eighteen electric and gas companies in Georgia are represented on the committee.

Lincoln-Plattsmouth Line Goes Into Service in Nebraska.—The 66,000-volt line of the Nebraska Gas & Electric Company extending from Lincoln to Plattsmouth, a distance of 57 miles, has just gone into service, being operated temporarily at 33,000 volts. The line, which forms a link between the South Platte and the Iowa and north Missouri properties of the Continental Gas & Electric Corporation, is of extremely durable construction and the first of its standard and voltage in the region it traverses.

Los Angeles Power Bureau to Spend $9,750,000 in 1925. — Extensions and improvements requiring a total investment of $9,750,000 will be carried out during 1925 by the municipal power bureau of Los Angeles, according to Chief Electrical Engineer Scattergood. About $5,975,000 will be spent to finance extensions and betterments on the system within the city. The program is a part of a three-year construction plan that will require the investment of $21,000,000. Of this $16,000,000 will be supplied from bonds voted last August and $5,000,000 from surplus earnings.

New York Mayors Favor State Development of Water Power.—The advisory committee of the New York State Conference of Mayors, of which Mayor M. P. Neal of Oswego is chairman, has adopted a program of legislative recommendations, chief among which is state development and distribution of hydro-electric power, legislation authorizing municipalities to construct, lease, own and operate public utilities, and amendments to the Public Service Commission law giving cities the right to enforce contract conditions in franchises.

Veteran New York Edison Employees Get Medals.—On Tuesday, January 13, John W. Lieb, vice-president of the New York Edison Company, at a meeting of the employees' association of that company, presented service buttons to the company's "quarter-century" men and women. The roster of Edison veterans includes 226 whose employment began between October, 1878, and January, 1900. Of these, 192 are still in active service and thirty-four have been retired. Among those still in service are thirty-three whose records date from the "eighties."

Commonwealth Edison Breaks Maximum Peak-Load Record.—A new record maximum load has been "hung up" by the Commonwealth Edison Company of Chicago. This figure, established between 5 p.m. and 5:30 p.m. on Friday, December 19, is 697,000 kw., which exceeds last winter's maximum by 62,000 kw. The company declares it to be the largest load ever registered by an electric utility company anywhere in the world. A new record for a twenty-four-hour output was established on December 23, the figure being 10,492,000 kw.-hr., or more than the output for the entire year of 1893, when the World's Fair was held.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, January 3, page 76.]

Electrical Safety Conference — New York, Jan. 21. R. B. Shepard, 109 Leonard St., New York.

Indiana Utility Association—Indianapolis, Jan. 22.

American Institute of Electrical Engineers, — Regional conventions, Washington Hotel, Washington, Jan. 23-24; Swampscott, Mass., May 7-9; Cleveland, May 22-23.

Western Association of Electrical Inspectors — Brown Hotel, Louisville, Ky., Jan. 27-29. G. M. Miller, 1304 South Seventh St., Louisville.

Wisconsin State Association of Electrical Contractors and Dealers—Pfister Hotel, Milwaukee, Jan. 28-30. H. M. Northrup, 23 Erie St., Milwaukee.

Wisconsin Utilities Association—Hotel Pfister, Milwaukee, Feb. 5-6. J. N. Cadby, 443 Washington Bldg., Madison, Wis.

New Mexico Electrical Association—Albuquerque, N. M., Feb. 16-18. Bernard L. Wiles, Albuquerque Gas & Electric Company, Albuquerque, N. M.

American Institute of Electrical Engineers—New York, Feb. 9-12; St. Louis, April 13-17; Saratoga, N. Y., June 22-26. F. L. Hutchinson, 33 West 39th St., New York.

American Institute of Mining and Metallurgical Engineers—New York, Feb. 16-19. F. F. Sharpless, 29 West 39th St., New York.

Wisconsin Chapter of Electrical Inspectors—Pfister Hotel, Milwaukee, Feb. 17-19. A. C. Schultz, Milwaukee.

American Physical Society—New York City, Feb. 27-28; Pasadena, Cal., March 7.

Illinois State Electric Association—Hotel Sherman, Chicago, March 18-19. R. V. Prather, Illinois Mine Workers' Bldg., Springfield, Ill.

Southwestern Division, N. E. L. A.—Eastman Hotel, Hot Springs, Ark., April 21-24. S. J. Ballinger, San Antonio Public Service Co., San Antonio, Tex.

American Electrochemical Society—Niagara Falls, N. Y., April 23-25. C. G. Fink, Columbia University, New York.

Southwestern Public Service Association—Rice Hotel, Houston, Tex., May 5-8. E. N. Willis, 403 Slaughter Bldg., Dallas.

Electrical Manufacturers' Club—Hot Springs, Va., May 19-22. S. B. Belden, Jeffrey Manufacturing Co., Columbus, Ohio.

Electric Power Club—Hot Springs, Va., May 26-29. S. N. Clarkson, B. F. Keith Bldg., Cleveland, Ohio.

Electrical Supply Jobbers' Association—Hot Springs, Va., June 2-5. Franklin Overbagh, 411 S. Clinton St., Chicago.

National Electric Light Association—San Francisco, June 15-19. M. H. Aylesworth, 29 West 39th St., New York.

Electricity Succeeds Kerosene at President's Birthplace. — An electric power line will be strung 11 miles from Ludlow, Vt., to Plymouth, President Coolidge's home village, next summer, according to an announcement made by the Vermont Hydro-Electric Corporation at Rutland. The line will extend to the Post Office building, where the executive offices were maintained during the President's vacation last summer, and the service will be available to the President's father and other farmers.

Two Mergers Reported in Arkansas.—News of two contemplated mergers of electric light and power companies comes from Arkansas. The Arkansas Power Corporation, which is building a water-power plant on the Little Red River, is to be taken over, it is said, by the Southern Power & Light Company, which controls the Louisiana Power & Light, the Arkansas Light & Power and the Mississippi Power & Light companies. The Northwest Arkansas Utilities Company, which owns the plants at Fayetteville, Rogers and Springdale, Ark., will be taken over by the Southwest Power Company, a subsidiary of the Albert Emanuel Company of New York, and will be linked with a chain of plants in western Arkansas and eastern Oklahoma. This transaction, it is said, involved more than $1,000,000.

Ultimate Capacity of Colfax Station 300,000 Kw.—The present and ultimate capacity of the Colfax generating plant of the Duquesne Light Company were understated in the item printed in "News of the Industry" on December 20. The plant is not yet complete. General Manager J. M. Graves sends the following authoritative statement: "Instead of installing the third and last 30,000-kw. turbo-generator at this plant, we are now just completing the second 30,000-kw. turbo-generator of our third 60,000-kw. unit. The first two of these units consist of three cross-compound 20,000-kw. turbo-generators each and the third of two 60,000-kw. single-cylinder turbo-generators. This will bring the present capacity of the station up to 180,000 kw. The ultimate capacity of this plant will be five 60,000-kw. units, or a total of 300,000 kw., three units of which are now installed."

Hagerstown (Md.) Municipal Plant Awaits Legal Decision.—The Mayor and City Council of Hagerstown, Md., find themselves unable to proceed with the erection of the new municipal electric light plant until the courts decide whether or not the act passed by the Legislature last year to exempt the city of Hagerstown from the jurisdiction of the Public Service Commission, which had denied the city the right to erect the plant, is constitutional. The Legislature exempted Hagerstown from the commission's jurisdiction on the ground that the city had operated its light plant before the Public Service Commission was created. Citizens fighting against the municipal plant contend that the act is unconstitutional on the ground that it is "class" legislation.

Men of the Industry

J. H. Trumbull Takes Oath as Governor of Connecticut

John H. Trumbull, president of the Trumbull Electric Manufacturing Company, Plainville, Conn., took the oath of office as Governor of Connecticut on January 8. This rather unusual political recognition of a man whose activities have been essentially in the industrial field will be of decided interest to the electrical industry. Mr. Trumbull was elected State Senator from his home district four years ago and was appointed chairman of the finance committee. Immediately at the expiration of the first term he again was elected State Senator and chosen head of the finance committee and also nominated for president pro tempore of the Senate. He then was third official of the state and on several occasions during the absence of the Governor and Lieutenant-Governor acted in their

J. H. TRUMBULL

stead. Although Governor of the state, Mr. Trumbull will keep actively in touch with the business of the Trumbull Electric organization.

Illinois Power & Light Appoints New Publicity Manager

C. W. Barber, formerly commercial manager of the Enid division of the Oklahoma Gas & Electric Company, has been appointed publicity manager of the Illinois Power & Light Corporation, with headquarters at the general offices of the company in Chicago. Mr. Barber has had a wide experience in the utility field, for the last five years as a member of the Oklahoma Gas & Electric organization and for eleven years prior thereto with the Buffalo (N. Y.) General Electric Company. While his primary work in the utility business has been along commercial lines, especially in the oil fields and as regards general industrial power, he has looked after public relations and other phases of the industry. He has acquired more than a local reputation as a writer of magazine articles, plays, sketches and publicity work, also as editor of the house organ, *Sparks and Flashes*. Serving as chairman of the lighting sales committee of the Southwest Geographic Division of the National Electric Light Association for three years and also as an active member of the Buffalo chapter of this organization, he has contributed several papers on subjects of interest to the central-station industry.

A. L. Arenberg Resigns

Albert L. Arenberg, manager of the lighting division of the Central Electric Company, Chicago, has resigned his position, with a view toward purchasing an existing manufacturing and jobbing business or possibly organizing a new one. Mr. Arenberg, who is known to the trade through his activities in connection with the design, manufacture and sales promotion of lighting devices, has been with the Central Electric Company ever since he was graduated from electrical engineering at the Armour Institute of Technology eleven years ago. He has held various positions in national and local electrical organizations, having been a member of the National Electric Light Association committees on commercial architectural lamp equipment, industrial lighting and store lighting; past-chairman of the illuminating engineering section of the Western Society of Engineers and past-secretary and chairman of the Chicago Section of the Illuminating Engineering Society. At present he is a member of the board of directors of the Illuminating Engineering Society and a director of the Electric Club of Chicago.

E. R. Hughes, who has been a member of the Oklahoma Public Service Commission, was recently elected its chairman, succeeding J. B. Cobb.

Paul H. Sommer, for the past two years superintendent of the electric department of the West Virginia Utilities Company, Morgantown, has been promoted to the position of general superintendent of the properties, taking over the routine administration formerly handled by J. K. Buchanan, recently advanced to the office of vice-president and general manager.

Henry J. Sage, for about fifteen years district manager of the Pittsburgh and Boston offices and special commercial representative of the Crocker-Wheeler Company, and more recently New England representative of the Kerr Turbine Company, Wellsville, N. Y., has been elected second vice-president of the Robbins & Myers Company, Springfield, Ohio. Mr. Sage will be identified with the commercial organization of the Robbins & Myers Company in the field, assisting President F. S. Hunting in looking after commercial organizations and extension of general business. For a time he will be stationed in New York City, engaging in special work in that city and the Eastern territory. He is well fitted for this work, having had considerable experience in special sales department organization work with the Crocker-Wheeler Company. The office of second vice-president is a new one, and is a part of the Robbins & Myers Company's plan to increase its business this year.

D. W. Taylor Joins "Electrical World" Staff

Dean W. Taylor, who for the past two years has been connected with the subsidiaries of the Central Indiana Power Company as power engineer in the development of new business among industries of central Indiana, has been appointed assistant Western editor of the ELECTRICAL WORLD, with headquarters in the Chicago office. Previous to his service in Indiana, he devoted three years to the new-business activities of the Wisconsin-Minnesota Light & Power Company, with headquarters at Eau Claire, Wis. Before going to Wisconsin he had spent three years in the power sales department of the Public Service Company of Northern Illinois, working in the industrial district adjacent to Chicago. Mr. Taylor was graduated from the University of Michigan

D. W. TAYLOR

in electrical engineering and went from there to the Consolidated Gas, Electric Light & Power Company of Baltimore. Before entering college Mr. Taylor had gained experience in utility and industrial work through service with the Des Moines Electric Company and the Walworth Manufacturing Company.

John R. Macomber has been elected a director and a member of the executive committee of the Puget Sound Power & Light Company, Seattle, Wash.

Col. Charles H. Tenney, founder of Charles H. Tenney & Company, Boston, and chairman of the board, was guest of honor January 6 at a banquet given in the Copley-Plaza Hotel, Boston, by directors, associates, executives and department heads of the companies under this management in celebration of the twenty-fifth anniversary of the inauguration of "Tenney service" at the Malden (Mass.) Electric Company, the first property of this syndicate. A. B. Tenney, senior vice-president, outlined the history of the organization, which has grown in the quarter century from a single utility with assets of $100,000 to a group of centralized properties with assets of $75,000,000. Allen Hollis, general counsel Charles H. Tenney &

Company, presented Colonel Tenney with a hammered silver bowl and set of cups on behalf of the entire organization.

V. D. Jennings is now treasurer of the Central Maine Power Company, Augusta. He is succeeding Walter S. Wyman, who was recently elected president of the company.

J. W. Southin, municipal electrical engineer of Point Grey, British Columbia, has been elected secretary of the British Columbia sub-committee of the Canadian Engineering Standards Association, appointed to prepare an electrical code for the Dominion.

P. J. Montgomery has been appointed manager of the Grand Forks (N. D.) division of the Northern States Power Company. Mr. Montgomery has been connected with the organization since it came under Byllesby management in 1912, being employed at that time in the accounting department of the Minneapolis office of the company. In 1919 he was transferred to the Minot division and in 1923, upon the acquisition of the Wisconsin-Minnesota Light & Power Company properties, he was transferred to that division.

E. L. Booth, who has been connected with the Bellaire, Ohio, office of the Wheeling Electric Company, has been transferred to Wheeling as general superintendent, succeeding T. W. Smith, resigned.

H. C. Hamilton has been promoted to the office of assistant superintendent of the standardizing and testing department of the Edison Electric Illuminating Company of Boston. Sixteen years ago Mr. Hamilton entered the employ of the company as an electrical test man in that department and since that time has been closely identified with the development of the laboratory.

Harry G. Disque, district manager of the Bay Ridge division of the Brooklyn Edison Company, has been appointed appliance manager of the company to succeed Willard Hall, recently resigned. Mr. Disque has been identified with the Brooklyn organization for nineteen years.

R. J. Conklin, for many years superintendent in charge of the electric properties of the Wisconsin Gas & Electric Company at Watertown, has been promoted to the office of manager to handle both the electric and gas business of the company in that city as well as the growing urban and rural business in the surrounding areas.

George W. Farnham, who for a number of years has been associated with the McGraw-Hill Book Company, publishers of engineering, scientific and business books, New York, has been made manager of the educational department of that company.

A. H. Sikes, who has been in charge of the electric and gas properties of the Wisconsin Valley Electric Company at Stevens Point, Wis., during the past eight and one-half years, has tendered his resignation to take effect February 1. Mr. Sikes will affiliate himself with the Illinois Power & Light Company.

John Alexander has been appointed manager of the Illinois Northern Utilities Company at Sterling, Ill.

R. A. Sharon Joins Great Western Power Company

R. A. Sharon has been appointed assistant sales manager of the Great Western Power Company, San Francisco. For several years past he was engaged in sales work with the Standard Oil Company in California and in the Northwest. Mr. Sharon was graduated from Yale University in 1912, having specialized in electrical engineering. From that time until 1918 he was industrial power salesman with the City Electric Company of San Francisco. In his new work with the Great Western Power Company he will have charge of industrial power sales and public relations.

R. A. SHARON

A. F. Chamberlain Enters Real Estate Field

A. F. Chamberlain, for the past eleven years New York manager of the Robbins & Myers Company, manufacturers of electric fans and motors, has resigned his position to become associated with the Harrison S. Colburn Company, New York, specialists in waterfront and industrial real estate on the Atlantic tidewater. Mr. Chamberlain was graduated from Purdue University as an honor student in engineering in 1900. After a year or two as instructor in Purdue, he became associated with the Westinghouse Electric & Manufacturing Company, where he remained eleven years in the capacity of first district engineer, and later as engineer of the industrial and power sales division of the company's Cincinnati office. Mr. Chamberlain's many friends in the electrical industry join in wishing him the fullest measure of success in his new undertaing.

A. F. CHAMBERLAIN

Obituary

Captain Henry M. Stine, secretary of the Pennsylvania Electric Association, with offices in Harrisburg, Pa., died at his home in that city January 2 in his sixty-third year. Captain Stine was a graduate of Dickinson College, Carlisle, and of the Dentistry School of the University of Pennsylvania. He had for many years been prominently identified with public activities. He was also secretary and treasurer of the Pennsylvania Street Railway Association and in 1923 was president of the County Commissioners' Association of Pennsylvania, at the time of his death being chairman of the legislative committee of that body. He served in the Spanish-American War and the World War.

J. A. Brett, manager of the Cincinnati office of the Westinghouse Electric & Manufacturing Company for nearly twenty years, died suddenly at Bermuda January 5. Mr. Brett began his career as an industrial engineer with the Sprague Electric Railway Company, where he took a four-year apprentice course. He next served as engineer with the Edison General Electric Company and one year as foreman of instructions of the General Electric Company. Then for eight years he was general manager of the Electric Installation Company of Chicago. He joined the Westinghouse company in 1904 as a salesman in the Chicago office. One year later he was made manager of the Cincinnati office.

John L. Billard, a director of the Meriden (Conn.) Gas & Electric Company, died at his home in that city, December 18, in his eighty-second year. Mr. Billard, who was one of the leading financiers of the state, was active in the litigation over the control of the Boston & Maine Railroad which resulted from the New York, New Haven & Hartford Railroad's acquiring the majority of the stock. For more than thirty years he was a director of the Second National Bank of New Haven and at the time of his death was a director of several industrial enterprises.

Frank Dabney, manager of the Puget Sound Power & Light Securities Company of the Stone & Webster organization, a notable figure in Seattle's business and community life, died in Seattle on December 12, following a short illness contracted immediately upon his return from an extended Eastern business trip. Mr. Dabney for a time was identified with coal-mining, timber and railroad interests in Ohio and elsewhere. He joined the Stone & Webster organization in Seattle in 1900. Years ago, when the Stone & Webster interests owned and operated the street-railway lines in Seattle prior to their sale to the city, Mr. Dabney was made assistant treasurer. At that time the company was known as the Seattle Electric Company.

Commission Rulings

Wisconsin Commission Again Forbids Excess Earnings for Municipal Plants.—The city of Kaukauna, Wis., endeavored to charge high rates for energy furnished by the municipal electric light plant, with the object of establishing a fund to purchase leased property on which some of the plant stands. This effort has, however, been attacked by the Wisconsin Railroad Commission, which has recently ordered a reduction in the rates charged by the city, reiterating its previously declared policy that municipal plants are no more entitled to excess earnings than privately owned plants. It is expected that this rule will next be applied to the municipal electric plant at Manitowoc.

Comparisons Between New and Old Stations No Criterion for Rate Fixing.—In discussing complaints against the rates of the Lehigh Navigation Electric Company and the Lehigh Valley Light & Power Company (now merged in the Pennsylvania Power & Light Company) the Pennsylvania Public Service Commission said that the fact that a new electric station, either existing or estimated, could deliver a kilowatt-hour on less coal than an existing station which began service several years ago is in itself no proof of inefficiency and no ground for reducing actual operating expenses of an electric utility. Moreover, average maintenance expenditures based upon a period covering early years of gradual rise and only a few years of higher levels cannot be considered as a fair figure to be used in testing rates for later years of the period, let alone the future; but rates may be tested on the basis of individual years, using expenditures actually incurred, and also on the basis of spreading these costs over a four-year period.

Principles Governing Service Extensions.—Sustaining a complaint against certain practices of the Willow River Company, the Wisconsin Railroad Commission said that a lower payment for an electric extension to a private customer than the payment demanded for an extension to a school building is not justified on the ground that the private customer is an old customer of good standing who has moved his place of business and that it is anticipated that other customers will come on this extension and pay sufficient connection charges to increase the original payment on the extension to the total cost price. An electric utility which has extended service to a private consumer at less than cost, in violation of its rules, should, the commission said, in order to avoid unreasonable discrimination, extend service to a school in conformity with the price paid by the private consumer. Rules followed by a public utility in making extensions are not equitable and reasonable if no provision is made for additional consumers coming on the extension nor for refund to the original consumer who may have made the investment in the extension.

Valuing Equipment of a Frequency Different from That Used in the Main by Utility.—Equipment clearly necessary to serve 60-cycle customers of a power utility and for the accommodation of frequency changes in order to help out a 25-cycle station was included by the Pennsylvania Public Service Commission in a valuation of the property of the concerns that now compose the Pennsylvania Power & Light Company, although the bulk of the utility's service was 25-cycle.

Management Fee Placed at About 1½ per Cent of Operating Revenue.—A proportionate part of management fee paid by an electric utility for services rendered in financing and accounting, assistance in solving operating problems, in engineering and various matters of an operating nature, and amounting to approximately 1½ per cent of operating revenues, was allowed by the Pennsylvania Public Service Commission in a rate case affecting the Lehigh Navigation Electric Company.

Rate of Return to Which a Municipal Plant Is Entitled.—The following extract from the decision of the Montana Public Service Commission in a case affecting the Monidan Trust and the Northern Pacific Railroad Company deals with the fair rate of return to be allowed to a municipal utility: "Ordinarily, of course, a municipality is satisfied with a less return than would be fair to a private concern, but, after a plant has been installed or before, the city may determine that it is best to operate on a profit-making basis, and it is entitled, if it so desires, to earn a return upon the fair value of the plant commensurate with what would be reasonable in the case of a private corporation, this return being for the benefit of the public. There are three modes of operation followed in this state at the present time: (a) Bare-living policy, whereby rates are constructed to cover all legitimate operating expenses and depreciation, but no other elements of cost, bond interest and amortization of bond indebtedness being provided for by tax levy; (b) service-at-cost policy, whereby rates are constructed to cover all legitimate operating expenses, depreciation and, in addition, interest on bonds issued, or if bonds are amortized, interest at the going rate for municipal borrowings on the fair value of the plant, and (c) service-for-profit policy, whereby rates are to be constructed to cover all legitimate operating expenses, depreciation, bond interest and, in addition, a percentage of return on the fair value of the property representing the difference ordinarily between the interest rate being paid and such rate as would be a fair return on the fair value of the same plant privately owned. This is only a marginal rate above a reasonable interest allowance. Capital for the plant must not be furnished through rates. It is to be provided by the municipal corporation as an investor, and the municipal corporation should look upon its plant as a business enterprise and so manage it that it will return legitimate operating expenses, depreciation and bond interest in lieu of fair return, or a fair return in lieu of bond interest."

Recent Court Decisions

Nebraska Rural Electric District Law Overthrown.—As stated under "News of the Industry" for November 1, 1924, p. 966, the Nebraska Supreme Court has (in Elliott vs. Wille) declared unconstitutional the rural electric district laws of that state, which provided for the formation of electric distribution districts by a majority vote of the electors residing within the proposed district when a petition had been filed by a certain number of them requesting that the question of the formation of a district be submitted to the electors. The electors also selected directors to manage the district, which had power of eminent domain, power to make contracts, to sue and be sued and such other powers as are granted under the general incorporation laws. The district through its board of directors, when authorized by the electors, had power to issue bonds and to determine the amount of money necessary to be raised to conduct its business affairs. To the board was also given power to propose a schedule of charges for service within the district, and upon approval by the state railway commission this became the legal schedule. Provision was also made for requiring any person, firm or corporation engaged in the production of electrical energy for commercial purposes passing through or adjacent to any district to furnish electrical energy at rates substantially the same as those under which it furnished electricity to other customers, provided that such person, firm or corporation had sufficient plant to furnish energy to said district without prejudice to its previous service. Reversing a former opinion which sustained the law, the Supreme Court said: "The statutes in question make no provision for a tribunal to determine whether any lands have been unjustly included in or excluded from the district, or whether the organization of a particular distribution district will be for the public convenience or welfare, save and except the action of the petitioners and their self-selected electorate. The situation is not unlike that which would exist if a party to an action could select the jury by whom his cause was to be tried. If disposed to be unfair, he might select only such persons for jurors as would view his contention with favor, and under such circumstances he would be reasonably sure of a favorable verdict. It is intolerable to think that such a situation should exist under sanction of law. In enacting the legislation under consideration we have no doubt the legislature was actuated by proper motives, but it has failed to make any provision to safeguard the rights of property owners whose property may receive no benefit from the public improvement contemplated and yet be taxed to construct and maintain it, or whose property has been wrongfully included." (200 N. W. 347.)*

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

Henry Ford Methods in Appliance Field

Experience in Manufacture of Electric Cookers Shows How Reduction of Prices Brought More Profit

By J. H. Reichart
President Excel Electric Company, Muncie, Ind.

NOT long ago I read in the ELECTRICAL WORLD an editorial entitled "Wanted—a Henry Ford to Make Electrical Appliances." It pointed to the fact that the electrical industry is actually falling behind in furnishing appliances to the homes of America, because newly wired homes are being connected to the light and power lines faster than complete equipments of electric household labor-saving appliances are being manufactured and sold. The editorial argued that the industry will ultimately be compelled to resort to large-volume production and lower prices if it is to meet the needs of the market and supply a thousand appliances where it now sells ten.

This article certainly "struck home" in my case for the simple reason that we here in our business are finding that the Ford system of manufacturing and merchandising is getting us a tremendously increased volume of business, and we can positively say that this plan can be made successful in the electric appliance industry.

A year ago we were selling a small electric cooker which retailed at $19.50, and the wholesale price that we received for this cooker was $10.53. We were making a little money at these prices. However, about the first of the year we took a step in the right direction and cut the price in two; in fact, the price at which we sold the cookers at that time was less than cost. We improved our manufacturing methods and processes until we were soon again making a profit. Still we didn't get the volume that we should.

Price Again Reduced

Again, a short time ago, we reduced our prices to a point which was once more below cost; but in the meantime we have so refined our methods of production that we are again making a profit. Summing it all up, we are making more money today and are building one thousand cookers where we formerly built one hundred.

The main difficulty we are encountering now is the fact that a great many of the electric service companies believe that they must sell on 100 per cent margin or else they will lose money. We know this to be absolutely wrong, but we are meeting with extreme difficulty in getting central-station companies in their turn to sell at a low price and thus get volume.

We adopted a policy about a year ago of fixing prices on any new device that we manufacture so as always to make the price below cost at the time it is first made. The most important result is the broadening of the market that follows. We are working up to capacity and more today because we have cut prices to less than the cost figure of a few months ago. Our prices are no longer less than cost, however, because we have refined our methods of production and we are now able to buy raw material for less inasmuch as we can buy in ever-larger quantities.

Furthermore, we have never lowered the quality of any article. We continually improve quality and still give more for less money. Eighteen months ago we received $10.53 for a small model cooker. Today we are building a better cooker and we receive $3.50 for it. As a result of these policies, we believe that we are manufacturing and our dealers are selling today more electric cookers than we ever would have.

I feel that if we had been in the vacuum-cleaner business or washing-machine business, our growth would have been still more phenomenal, for the simple reason that those appliances are well established and the distribution on them is exceedingly good. Few persons know anything about electric cookers, however, and we are constantly making an up-hill fight. But I feel that sooner or later—and indications are that it will be soon—other manufacturers will have to adopt policies like our own, or else they are going to find themselves without any business, owing to the fact that some other fellow will have taken the initial step. It will be a wonderful thing for the electrical industry when the manufacturers of electrical appliances generally meet this issue by cutting out the idea of long and big profits and getting right down to "brass tacks" on narrow margins and selling the smaller articles on a "cash-and-carry" basis.

Manufacturer's Interest in Application

Advisory Service Offered by Many Manufacturers but Not Extensively Accepted Would Prevent Many Misapplications of Equipment and Much Grief

By Walter A. Bates
Vice-President Bates Expanded Steel Truss Company, Chicago

IT IS not enough for the manufacturer of equipment used in technical applications to develop a production and distributing organization that will turn out the best product that can be purchased for the money. For selfish reasons, if no other, he should also be vitally interested in its being applied properly. Failure of an installation to meet the user's needs may be charged against the product applied, even though it is all that was claimed for it, and, after all, the manufacturer has a responsibility to insure satisfaction in the use of his product through its efficient operation. Consequently, although this company naturally takes every precaution to turn out "quality" products—these being expanded metal poles, fabricated structures and accessories—we do not feel that we can stop with that, and we earnestly seek the opportunity to advise our customers concerning the proper application of these products, just as do other manufacturers who have a right to be called progressive.

Because of the high caliber of engineering talent available in most operating companies it might be thought presumptuous or egotistical for a manufacturer to inquire into local conditions and recommend how his products should be applied to insure the most effective results, unless he were invited to do so. But there are many organizations which are not so fully provided with engineering personnel as they would like to be. Such companies, and even those more fortunate in the extent of their engineering staff, might be surprised to find the amount of valuable advice that can be obtained from manufacturers. For manufacturers of widely distributed products urge their representatives to study operating problems as well as to sell equipment. They stand, therefore, in the unusual position of being able to obtain a country-wide perspective on application problems and practices, and they can often make available outside experience which can be profitably utilized by even the best-equipped company.

Do Not Accept Help

If publicly expressed offers to render consulting advice were generally accepted or applications of products were seldom improperly made, there would be no occasion for emphasizing to equipment users this advisory service which manufacturers offer. Probably 95 per cent of our customers never seek this advice, yet from 10 to 20 per cent of the applications of our poles which we have observed are poorly or only fairly engineered. Of the remainder, 20 per cent are very well engineered and from 60 to 70 per cent reasonably well. But the errors in the 10 per cent of the applications and the lesser weaknesses in the reasonably well-engineered applications could have been prevented if the manufacturer's advice had been sought and followed.

Some of the most flagrant misapplications in our case have been (1) failure to provide proper pole or tower footings, (2) placing axis of poles im-

properly with respect to line, (3) total omission or too infrequent use of guying and anchor towers, and (4) improper grading of strengths between conductors and pole or tower foundation. Other errors could be cited, but their proper discussion should take into account specific conditions. Generalities are too liable to misinterpretation.

SPECIALIZED KNOWLEDGE

It is perfectly natural that there should be many conditions affecting such a product with which the purchaser will not be familiar. In substituting steel for wood poles, for instance, it must not be forgotten that the advantages of steel cannot be fully realized without providing a suitable foundation. The best footing, in the opinion of the writer, is a cast-in-place concrete foundation. A precast concrete footing ranks next best and a steel footing next. This is because a concrete foundation protects against rust or corrosion of the pole at the ground line, it being assumed that the concrete will extend 6 in. above ground and be waterproofed in very wet soil.

Longitudinal and transverse strength in such a pole line is achieved by setting the expanded-steel poles with their expanded truss transverse to the line, guying the poles head-and-back every half mile or approximately every tenth pole and providing dead-end H frames or strain towers frequently. In cases where poles are not "stayed" at intervals and no dead-ends are installed danger exists. A hurricane traveling along the line would build up the aggregate wind pressure on the poles until conductors would break and the entire tangent line of poles go down like a deck of cards. While it is hardly economical to design a line to withstand unusual hurricanes, still ordinary storms should be provided against by correctly engineered line construction.

Some customers in purchasing expanded-steel poles apparently expect to derive the same strength as from steel towers for less money. It cannot be done. They are receiving and paying for a type of support intermediate between a wooden pole and a steel tower. This company, when fully advised of conditions, will never countenance the use of an expanded-steel pole when a fabricated tower should be used, and, being a manufacturer of both, no prejudice exists and we can advise with a mind solely to the user's interests. But in our opinion there should be more than a willingness to help on the part of the manufacturer. He should accept a responsibility to see that his product is safely and effectively used, and the purchaser should recognize this responsibility and accept the manufacturer's guidance in the settling of a pole, for instance, just as he accepts the manufacturer's judgment as to how the pole should be designed and made.

Some Net-Price-Sheet Testimony

E. H. Freeman Tries Out a Net Price Sheet on Wiring Devices—Testimonials from Distributors and Retailers Clearly Express Their Views

LAST August the E. H. Freeman* Electric Company of Trenton, N. J., manufacturer of wiring devices, issued a price sheet covering its entire line that gave in net dollars and cents the price of each device in less than carton lots, so much per socket or whatever it is, in carton to standard package lots, priced per hundred, and in lots of standard packages and over. And then it gives the retail price, so many cents each. It is a practical application of the net-price theory to what is looked upon as the most complicated and detailed line in the electrical supply field. It seemed, therefore, of interest to "check up" on results after a few months and see what the distributors and retailers of wiring devices think of this system of pricing. The following eight testimonials are worth considering:

1. "This new discount sheet is a knock-out. It certainly is of great assistance to any one who wants a price and ought to increase business."

2. "This price list is pioneering a much-needed move in getting away from the multiplicity of lists and discounts with which the industry has been afflicted during the writer's ken, and he has quite an old head."

3. "We are very much pleased with the new price list, since it saves considerable time and eliminates the necessity of figuring a discount on each individual item. We believe that after our customers become accustomed to this system they will rely upon it entirely in making quotations, and we know that this will increase business.

4. "We have congratulated this manufacturer on the step taken toward simplifying the intricacies of schedule-material price sheets as issued by most manufacturers. The writer has often wondered why price sheets on this class of material have always been made so difficult for the average buyer. It is only a question of time until other manufacturers will follow this lead."

5. "This new form of price list supplies a long-felt want to the contractor-dealer, and the manufacturer can appreciate how badly it was needed when his business doubles as a result."

6. "The writer having worked on and compiled more than fifty catalogs himself can readily realize the amount of detail work necessary in getting out a price list of this character. A price list in this form permits ready reference and should prove very profitable."

7. "Certainly a work of this kind constitutes a real contribution to the industry, and it is to be hoped that the time will come when prices will be quoted in this common-sense fashion instead of by the present involved method of figuring chain discounts."

8. "For a long time manufacturers of schedule material have put out price lists in such shape that it wasted everybody's time when one wanted to quote a price or check a bill. With your new price sheet, giving net prices for retail, for standard packing quantities and over, for cartons to standard packages and less than cartons, prices can be quoted readily and bills can be checked likewise." You have very wisely made a differential between less than carton, carton to standard package, and standard-package quantities—one that is reasonable and practicable. We believe that we can probably get business on these differentials as against the ridiculous differentials which other manufacturers have shown on their price lists for a long time past. The improvement over the old 'mess' which manufacturers of schedule material have obliged us to put up with is very great, and we shall try to show our appreciation of your co-operation in getting this price list out."

The only argument between the proponents and the opponents of the net-price list seems to be that one says it will help the distributor and the retailer and the other says it won't. This bid of scattered evidence would seem to weigh rather heavily for the pros.

*This company has recently consolidated with the Trenton Porcelain Company to form the Corde F Manufacturing Company. (See ELECTRICAL WROLD, December 27, page 1385.)

G. E. Talks to Stockholders

Views Corporation from Three Angles, Those of Public, Employees and Stockholders

ADEQUATELY to measure the service that a corporation renders and the contribution it makes to the community, the question must be considered from three points of view—first, from the standpoint of the public; second, from the standpoint of the employees, and third, from the standpoint of the stockholders. Gerard Swope, president of the General Electric Company, in his annual message to the stockholders thus outlines the ways in which the services of a corporation can be measured.

From the standpoint of the public, Mr. Swope says that among the contributions is the work of the research laboratories in the development and constant search for improvements of the incandescent lamp, which have so largely increased the efficiency of lighting and materially reduced its cost. Closely allied to this have been the research and engineering along the lines of radio, including the high-frequency alternator. Each year new accomplishments are announced for which many years of preparation had gone before, and Mr. Swope further points out that from the beginning the company has been a noted contributor toward the increase of efficiency in the generation of electric power.

From the standpoint of the employees, Mr. Swope shows that all payments to employees of the General Electric Company increased 38 per cent in 1923, to $120,601,000, while the average number of employees increased only 22 per cent, to 74,912. The average earnings per employee also increased from $1,419 in 1922 to $1,610 in 1923, or 13 per cent. Better working conditions, opportunities for study, a pension system, a saving plan and other benefits are provided for the employee.

From the standpoint of the stock-

holder, Mr. Swope says that for more than twenty years the company's return to its stockholders has been regular and uniform—never less than 8 per cent in cash; and in the last few years this has been increased by the inauguration of the policy of paying 5 per cent stock dividends in special stock and 6 per cent cash dividend on the special stock thus issued. In addition there is an increase in the surplus as shown in the company's reports. "The electrical industry is young" says Mr. Swope, "it is constructive and forward-looking and adds much to the happiness, contentment and material wellbeing of the people. There is no reason why it should not continue to make large contributions to the public in the way of diminished human labor, increased efficiency and lower cost of service. There is no reason why it should not pay a fair return on the money invested by its stockholders and to those who are spending a large part of their lives in the business— the employees."

Business Conditions

IMPROVING sales are gradually removing from the realm of forecast and mere belief the unanimous prediction of prosperity and better business for 1925. Industrial companies are steadily evincing increasing signs of activity and are purchasing in better volume. The railroads are active, and persistent, vigorous trading on the stock market presages a continued flow of good business. The General Electric Company has announced that its sales for the quarter ended December 31 were $80,009,978—7 per cent above the corresponding period in 1923. The International General Electric Company has also announced the receipt of an order for two turbo-generators for Japan amounting to approximately $1,000,000. Several manufacturers and jobbers report a better sentiment among customers, and the general impression is that more money appears to be available to make purchases.

A prominent factor that will affect the future demand of utility companies is the readiness with which securities are being taken by the public. The one-hundred-and-twenty-five-million-dollar bond issue of the American Telephone & Telegraph Company and the notes of the Edison Electric Illuminating Company of Boston for $30,000,000 were readily sold last week. The strength of the market for these issues has encouraged the placing of other public utility securities. The United States Steel Corporation reported on Saturday a gain of 784,707 tons in unfilled orders during December. This is the largest monthly gain reported in any month since December, 1919. The strength of the copper market has again caused the American Brass Company to advance prices.

In the New England district industrial plants are entering the market more actively than for some time. Motor sales are numerous, though of small size, and some good sales of industrial electric trucks have been made. The volume of business transacted in the New York district is good and is slowly increasing. Industrial plants in that section appear to be gradually becoming more active. In the Southeast building and line construction work have been badly retarded by inclement weather. Some textile-mill electrification contracts have been announced in the past ten days, with additional good prospects, and the demand for elevators is good. High-tension equipment sales have been very good in the Middle West, and some interesting orders for lead-covered paper cable and busbar copper were placed. On the Pacific Coast construction has been little interrupted by winter conditions.

Portable Electric Drills Used Successfully in Agriculture

PORTABLE electric drills are now being placed in service in the fruit-growing sections in southern California in the vicinity of Los Angeles, where recent demonstrations have proven the facility of electric power for drilling. In one instance a pair of motor-driven automatic augers were used mounted on a small truck, and holes were bored for approximately 60,000 grapevines in a period of ten days. This was an average of 6,000 holes, 3 in. in diameter and 18 in. deep, dug daily. The estimated saving over the usual manual labor employed for this purpose aproximated $400 per day.

Building Construction in 1924 Surpasses Record

TOTAL contracts awarded during 1924 in the thirty-six Eastern States, which include seven-eighths of the total construction volume of the country, amounted to $4,481,807,000, according to the F. W. Dodge Corporation, indicating that the total volume for the entire country was well over five billion dollars. The increase over 1923, which was itself a record-breaking year, was 12 per cent. Construction activity was maintained at a fairly even pace throughout the year, the volume of work started during the second half being only slightly less than that started during the first half. Even the month of December, with a building contract total of $327,985,900, showed a 9 per cent increase over December, 1923, although last month dropped 14 per cent from November.

The big increase in building volume was shared by every important class of construction except industrial. Contemplated new work reported in 1924 amounted to $6,652,297,700. This was about 11 per cent under the volume of newly planned work reported in 1923. It exceeded the total of work actually started in 1924 by 48 per cent, the normal excess being somewhere near 50 per cent. Last year was the first year since the war that showed a normal ratio of contemplated work to contracts awarded. This indicates a smaller relative volume of planned work deferred for the ensuing year than there has been at any time since the war. Increased demand for industrial buildings, public works and utilities and the smaller types of residentia. buildings suitable for the wage-earning classes is likely to develop as the new year progresses. The demand for the other types of buildings has for the moment been largely taken care of. For this reason it now seems unlikely that the 1925 building program can again break all previous records or even equal the enormous volume of last year.

Electrical Exports Increase $12,000,000 During 1924

EXPORTS of all classes of electrical equipment for 1924 will approximate $85,000,000 and will exceed the 1923 total by about $12,000,000, according to the Department of Commerce. This estimate is based on trade figures for the first eleven months of the year and does not include figures covering exportation of such electrical equipment as motor cars, the built-in motors of machine tools and the like. Radio exports for the year just passed will undoubtedly exceed $5,000,000. Of the North American markets, which are the most important, Canada still leads.

South America has now receded from third to fourth place in our foreign markets—this being based upon the figures for the first nine months of 1924. Among the various countries in South America, Brazil was the largest purchaser in 1924—maintaining a consistent demand for electric goods in general, but importing also an increased number of electric locomotives. As compared with 1923, a slight decrease is encountered in our electrical exports to European markets. Great Britain retains her lead among European purchasers. Our exports to Australia and New Zealand during 1924 exceed the 1923 total of $4,511,544 by approximately $1,000,000. The bulk of our exports to Australia consisted of telephone equipment, medium and small-sized motors, switchboards, switchgear and a wide range of electric household appliances. To New Zealand our exports consisted principally of line material and other equipment necessary for the extensive power distribution projects under construction in that country. In the African field, of which British South Africa is our most important market, there was a substantial increase in our 1924 trade over that of 1923. Electrical exports for November are listed in the table on the following page.

Metal Prices Advance Further in Quiet Market

PRICES of the non-ferrous metals have advanced further owing to higher levels in Europe and the fact that American producers have booked orders covering almost their entire output. Current sales, however, are only moderate in volume. Last week, Thursday and Friday, some sellers were unable to get more than 15 cents delivered for copper which they were anxious to dispose of. Practically all interests have since then asked 15¼ cents for Eastern deliveries and have sold moderate tonnages at that level.

NEW YORK METAL MARKET PRICES

	Jan. 7, 1925 Cents per Pound	Jan. 14, 1925 Cents per Pound
Copper, electrolytic	15.05–15⅛	15⅛
Lead, Am. S. & R. price	10	10⅛
Antimony	17⅛–18	17⅛
Nickel, ingot	31	31
Zinc, spot	8.175–8.20	8.22½
Tin, Straits	60	58½
Aluminum, 98 to 99 per cent	28	28

Producers are willing to accept orders for January, February and March at that figure and in some instances have been compelled to include April shipment also. Foreign sales have been relatively better than domestic.

The American Smelting & Refining Company advanced its official contract price for lead from 10 to 10⅛ cents on Thursday, January 8, and again to 10½ cents on Monday, January 12. Corresponding advances were made by other sellers, but consumers show a disinclination to pay premium prices. The present price is almost if not quite high enough to permit lead smelted in this country from foreign ore to be sold in the domestic market for future delivery.

Zinc is holding firmly at advancing prices that are really set by export parity. Small producers who have offered the metal have quickly sold out. Prompt zinc is scarce, and slightly lower prices are asked for forward deliveries than for spot. Tin is fairly active as small recessions in price have tempted buyers so that fairly good tonnages are being sold at 58½ cents to 59 cents for spot with premiums of ⅛ cent to ¼ cent asked for forward.

Sales in New York District Good—More Signs of Activity

MANUFACTURERS report that a little more business is being transacted in the New York district, and while the volume is not increasing at any startling rate, it is better. The sentiment of customers has generally improved, and there are more signs of life among the industrial companies and the railroads, which seem to have more money to spend. Sales so far this month indicate that a good average month's business will be closed. There are rumors of many new developments among industrial companies, and several plans are being made for new industrial buildings. It is the sentiment among electrical men that steady progress can be expected.

Since the first of the year utility companies have not been very active purchasers, although many orders have been placed for general supply material. Many propositions, however, are in process of development. Jobbers report sales as very encouraging and well distributed. December sales are said to be better than the corresponding month in 1923. Manufacturers of line construction material and switching equipment state that business is quiet, but this is said to be usually the case in January.

Construction Work on Pacific Coast Proceeding Actively

CONSTRUCTION work on the Pacific Coast has been very little interrupted by winter conditions. Pole-line-equipment orders from the larger companies remain ordinary, but the smaller companies and industrial plant owners are furnishing excellent business. Prices and deliveries are unusually emphasized in ordering because of the general expectation of price increases. Prompt deliveries of orders for staples are the rule, but there is undoubtedly some pyramiding of orders for radio apparatus on which delivery is not so good. Agents for radio parts say that their sales have almost ceased.

Many railroad requisitions are reported, mainly for schedule items and reflectors. The appropriation of the United States Forest Service may mean the purchase of much wire, insulators and signal apparatus in view of last year's serious forest fires. Lamp business is characterized by the appointment of an increasing variety of agents and by the tendency of industrial companies to make larger contracts. Schedule-material business is good and well distributed. A brisk range campaign is getting under way in northern and central California, marked by cencentration on fewer makes and models and by co-operation with local dealers.

Various miscellaneous cords and cables recently advanced about 5 per cent. There is heavy ordering in expectation of a sharp advance. One order of 200,000 ft. of assorted rubber-covered wire has been reported,—while nearly all dealers in the larger cities have protected themselves to the extent of a 25,000 ft. assorted order. The steel market increases have also produced heavy ordering in conduit boxes in expectation of advances which so far have not materialized.

Industrial Business Growing in New England District

INDUSTRIAL plants in the New England district are coming into the market more actively than for some time. Inquiries are increasing fast, and sales of supplies for rehabilitation work are putting considerable pressure upon the jobbers. Motor sales are numerous, albeit confined mainly to small sizes, and commercial lighting is still absorbing much attention in both central-station and industrial circles. Recent sales of industrial electric trucks to central-station companies and

Value of Electrical Exports for November, 1924, Compared with Corresponding Month in 1923

(Issued by Bureau of Foreign and Domestic Commerce)

	November 1923	November 1924
Generators:		
Direct-current:		
Under 500 kw.	$71,561	$59,658
500 kw. and over	51,624	23,060
Alternating-current:		
Under 2,000 kva.	13,504	8,750
2,000 kva. and over	14,248	44,000
Steam turbine-generator sets	*	586
Accessories and parts for generators	216,340	148,132
Self-contained lighting outfits	37,184	38,305
Batteries:		
Flashlight	*	91,521
Other primary	120,162	87,798
Storage	181,568	216,811
Transforming or converting apparatus:		
Power transformers	397,212	112,540
Other transformers	76,507	143,427
Rectifiers, double-current and motor-generators, dynamotors, synchronous and other converters	67,678	137,227
Transmission and distribution apparatus:		
Switchboard panels, except telephone	38,672	238,390
Switches and circuit breakers over 10 amp.	121,956	225,589
Fuses and fuse blocks	30,927	22,247
Watt-hour and measuring meters	43,220	34,977
Volt, watt and ampere meters and other recording, indicating and testing apparatus	122,414	128,623
Lightning arresters, choke coils, reactors and other protective devices	72,121	45,470
Motors, starters and controllers:		
Motors under 1 hp.	104,999	133,869
Stationary motors:		
1 to 200 hp.	262,392	137,501
Over 200 hp.	81,937	29,141
Railway motors	133,022	94,230
Electric locomotives:		
Railway	13,251	.....
Mining and industrial	38,373	1,440
Other motors	40,186	†
Starting and controlling equipment	171,044	.....
For industrial motors	*	62,405
For electric railway and vehicle motors	*	1,193
Accessories and parts for motors	176,901	201,458
Electric fans	59,263	21,268
Electric lamps:		
Incandescent—total	83,616	84,788
Carbon-filament	6,285	4,747
Metal-filament	77,331	80,041
Other electric lamps	$29,537	$24,239
Flashlights	39,341	63,424
Searchlights and projectors	55,630	13,138
Motor-driven household devices	66,662	83,105
Domestic heating and cooking devices	79,980	100,783
Industrial electric furnaces and ovens	13,899	23,487
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, etc.	92,821	101,686
Signal and communication devices:		
Radio and wireless apparatus	381,826	948,993
Telegraph apparatus	15,248	53,739
Telephone apparatus:		
Magneto telephones	15,106	18,429
Other telephones	38,649	30,262
Magneto switchboards	870	619
Other telephone switchboards	67,499	12,092
Other telephone equipment	.....	155,551
Railway signals, switches, and attachments	90,696	63,625
Bells, buzzers, annunciators and alarms	7,113	12,606
Other electric apparatus:		
Spark plugs, magnetos and other ignition apparatus	143,976	125,279
Insulating material	151,159	87,543
Metal conduit, outlet and switch boxes	55,265	32,036
Sockets, receptacles and lighting switches	93,190	105,348
Other wiring supplies	190,155	‡
Electric lighting fixtures, interior and street	.....	77,585
Other wiring supplies and line material	.....	76,467
Other electrical apparatus, not elsewhere specified	832,214	565,676
Globes and shades for lighting fixtures	49,210	41,368
Electrical glassware, except for lighting	12,433	24,589
Electrical porcelain	148,152	84,450
Electrical carbons, carbon brushes and electrodes	236,058	388,390
Insulated iron or steel wire and cable	54,108	20,676
Other manufactures of aluminum	52,833	52,323
Copper, bare wire	136,985	110,706
Copper, insulated wires and cables	255,120	298,612
Total electrical machinery and apparatus and supplies	$6,247,617	$6,371,284

Not separately stated prior to Jan. 1, 1924. † Discontinued beginning Jan. 1, 1924. ‡ Not stated.

to mills include about a dozen machines of 4,000 lb. and 6,000 lb. rating.

Central-station buying of line material for late winter and spring use is becoming more prominent. Last week two companies in Maine purchased about 25 miles of galvanized-iron strand guy wire, and pole-line hardware is moving well, especially in Massachusetts and Maine. Several contractors near Boston purchased flexible armored conductor in 5,000-ft. to 10,000-ft. lots, and interior wiring is under way in fair volume. A Maine company bought 25,000 ft. of loom recently, but on the whole the demand for this is low. Appliance sales are seasonally dull, although one manufacturer featuring free attachments is doing a tremendous business in vacuum cleaners in this territory. Portable lamps and irons are also active. The selection of McKim, Mead & White, New York, as architects for the new five - million - dollar business - school group of buildings for Harvard has aroused much interest in contracting circles.

High-Tension Equipment Buying Good in Middle West Trade

INDUSTRIAL purchasing has increased in volume in the Middle West and business continues active. Buying by the various utility companies remains generally good. Among the interesting orders placed by central-station companies was one for lead-covered paper cable aggregating over three-quarters of a million dollars. Another order for a large quantity of busbar copper was placed from St. Louis. High-tension equipment sales have been excellent, and there has been a good demand for pole-line hardware, insulators, indicating meters, etc.

Jobbers, however, have had a quiet week. While the volume of business is all that could be expected and many sizable stock orders after inventory have been placed, no exceptionally large business was transacted. One exception was an order for $52,000 worth of radio material. Considerable quantities of conduit, wire and wiring devices were sold and a number of orders for outlet boxes were received prior to the recent increase in price. Prices generally remain firm. There was an advance of approximately 25 per cent to 30 per cent on certain types of lamp guards. Indications would seem to point to another increase in code wire shortly.

Construction Work Retarded in Southeast by Inclement Weather

BUILDING and line construction work in the Southeast has been badly retarded by several weeks of rainy weather, and as a result orders for materials used in this work are considerably off. Florida is the only exception to this statement, and business generally in that state is active in virtually all lines, construction materials being particularly brisk. Inclement weather and the post-holiday season combined have served materially to slow down activities in the retail electrical field, though dealers generally are reporting a tendency on the part of the public to purchase heavier apparatus, such as ranges, etc., than was the case before Christmas.

Buildings nearing completion are causing an activity in the elevator business, most of the orders being for the alternating-current geared type, though several satisfactory orders have been received lately for the traction-type machine. A noticeable feature in this line during the past year has been the increase in the number of jobs requiring the high-speed type of machines, and the prospects for the coming year are very bright. The electrification of industrial plants under consideration has not yet taken definite form as a general indertaking, though some textile-mill electrification contracts have been announced in the past ten days and prospects are for a marked activity in this connection before spring is far advanced.

Activities of the Trade

Westinghouse Equipment for Use on Diesel Electric Locomotives

A new type of Diesel electric locomotive has been developed by the Baldwin Locomotive Works. This engine will be of 1,000-hp. capacity, although it is said to be possible to build engines of this type up to 4,000 hp. The generator and motor will be furnished by the Westinghouse Electric & Manufacturing Company.

Automatic Washer Salesmen Hold Conference

More than thirty sales representatives of the Automatic Electric Washer Company spent the first three days of 1925 at the third annual sales conference at the home office, Newton, Iowa. More than twenty central-station new-business managers also attended in order to discuss their sales problems in merchandising electric washers. This division was in charge of W. N. Gallagher, vice-president.

Parallel meetings were also held for the dealer sales representatives under the direction of Roscoe Bradt, assistant general manager. In discussing new-business plans and advertising, the company has set a quota for 1925 that is better than 1924 by 30 per cent. The conference terminated with a banquet Saturday evening at which a watch was presented to Harry L. Ogg, president.

General Electric Orders Show Increase for Last Quarter

Orders received by the General Electric Company for the three months ended December 31 totaled $80,009,978, an increase of 7 per cent over the same quarter in 1923, according to figures made public by Owen D. Young, chairman of the board of directors. For the year 1924 orders totaled $283,107,697, as compared with $304,199,746 for 1923, a decrease of 7 per cent.

Phoenix Electric Succeeded by Linzee Electric Motor Company

The Linzee Electric Motor Company, recently incorporated, took over and assumed control of the Phoenix Electric Company, Mansfield, Ohio, on January 1. The same financial interest and management of the Phoenix Electric Company for the past eight years will be actively associated and in control of the new incorporation.

For the present the new company will continue to manufacture the old type alternating-current machine, but in addition a complete new line of polyphase induction motors, in ball-bearing and sleeve-bearing types, to be known and sold under the trade name "Linzee type LB" and "type LS," have been designed and developed.

General Electric Receives Order for Nine Electric Locomotives

The General Electric Company has received an order from the New York Central Railroad Company for nine electric locomotives, seven 100-ton electric switching locomotives and two 170-ton electric road freight locomotives. The lcomotives, which are being built jointly by the General Electric Company and the American Locomotive Company, will be equipped for both third-rail and overhead collection of current. The specifications for the switching locomotives provide for handling a 1,500-ton trailing train, consisting of 75 per cent "empties" and the remainder loaded cars, at a speed of not less than 25 miles per hour. The road locomotives will handle a 3,000-ton train of the same general make-up at a speed not less than 32 miles an hour.

The Bryant Heater & Manufacturing Company, 952 East Seventy-second Street, Cleveland, manufacturer of electric heating equipment, announces that it has acquired a site comprising six acres on St. Clair Avenue at 179th Street, upon which it is planned to soon erect a modern two-story and basement factory building.

The Regina Corporation, Campbell and Cherry Streets, Rahway, N. J., manufacturer of vacuum cleaners, has appointed E. Gordon Hall, formerly sales manager for the Los Angeles district, as district manager for the company in New England, with headquarters at 221 Columbus Avenue, Boston.

The Reliance Electric & Engineering Company, 1046 Ivanhoe Road, Cleveland, manufacturer of alternating-current and direct-current motors, has awarded a contract to the Austin Company, Cleveland, for the erection of a one-and-two-story building, 80 ft. x 162 ft.

The Burke Electric Company, Erie, Pa., manufacturer of direct-current and alternating - current machinery, announces that the sales force of its Cleveland office, 7829 Euclid Avenue, which is in charge of L. L. Myers, has been increased by the appointment of

O. P. Hanchette, welding engineer, who will specialize on sales of electric arc-welding equipment and engineering service in connection therewith.

The Corliss Carbon Company, Bradford, Pa., announces that E. R. Shequine has been appointed sales engineer for the New England territory with offices at 146 Summer Street, Boston. Mr. Shequine was formerly connected with the Lynn works of the General Electric Company.

The Pawling & Harnischfeger Company, Thirty-eighth and National Avenues, Milwaukee, manufacturer of electric cranes and hoists, etc., announces that it has changed its corporate name to the Harnischfeger Corporation. The company further announces that this change of name was not accompanied by any change of management, organization, business policy or trademark.

The Kelvinator Corporation, 2073 West Fort Street, Detroit, announces that a new model Kelvinator know as the "Kelvin-et" has been placed on the market to sell at $250. This new unit is self-contained and is intended to meet the requirements of the small home owner or the renter of a house or an apartment.

The Consolidated Electric Lamp Company, Danvers, Mass., manufacturer of the Champion brand of lamps, announces that it has closed an incandescent electric lamp contract with the Commonwealth of Massachusetts for approximately 100,000 lamps, amounting to about $20,000.

The Delta Star Electric Company, 2433 Fulton Street, Chicago, manufacturer of high-tension switching equipment, has let a contract to the Austin Company for a steel-frame and brick building, one story high, 54 ft. x 125 ft. This new unit will be used for testing high-tension apparatus and will cost approximately $30,000.

The General Electric Company has disposed of its old lamp plant at Ampere, N. J., to the United States Tool Company, Inc., Newark, N. J. The property consists of three buildings, two-story and three-story, aggregating about 83,000 sq.ft. of floor area, all of which will be used by the new owner. The transfer will be made on February 1. This plant has not been in use for some time except as a storage warehouse. Its sale is another evidence of the increase in efficiency in the manufacture of lamps, necessitating the elimination of these small plants.

The Robbins & Myers Company, Springfield, Ohio, manufacturer of electric motors, generators and fans, announces that it has added a new 10-in. induction-type oscillating fan retailing at $21 to its line for the 1925 season. It is known as the "model 42" and is furnished for either 50-cycle or 60-cycle service, 110 volts or 220 volts, with three speeds.

The John Inglis Company, Ltd., Toronto, Canada, announces the formation of a subsidiary organization to manufacture and sell in Canada the "Smith" hydraulic turbine. The new company will be known as the S. Morgan-Smith-Inglis Company, Ltd., with headquarters at the John Inglis plant on Strachan Avenue, Toronto. H. B. Van Every, who has been the branch manager of the S. Morgan-Smith Company at Montreal for the past ten years, moves to Toronto and continues in his capacity as sales manager.

The Canadian General Electric Company had its offices and warehouse in Montreal, Que., destroyed by fire early this week. The loss is estimated at $250,000.

The Industrial Controller Company, 886 Greenbush Street, Milwaukee, manufacturer of electric control apparatus, is seeking larger quarters and is advertising in the local newspapers for a factory building with from 50,000 sq.ft. to 70,000 sq.ft. of floor space. It is planned to arrange for the purchase of a plant and move all operations by May 1, according to Fred L. Magin, general manager of the company.

The Robbins & Myers Company, Springfield, Ohio, manufacturer of electric motors, generators and fans, announces the appointment of the Rex Electric, Inc., New Orleans, jobber, as its New Orleans distributor of fans.

The Siemens-Schuckert Company, Germany, manufacturer of electrical apparatus, is reported to be in the American market for a loan that is understood to range from $10,000,000 to $15,000,000. Negotiations were not complete up to Thursday of this week.

The International General Electric Company has received an order for two 43,750-kva. turbo-generator units for Japan amounting to approximately $1,000,000. The first unit will be shipped this summer.

The Truscon Steel Company, Youngstown, Ohio, announces that, effective February 1, Oscar W. Loew will assume charge of the advertising and sales promotion work of the company.

Edward T. Moore announces the opening of his office at 500 Cahill Building, Syracuse, N. Y., for the general practice of consulting engineering and the manufacture of the "Moore" electric power regulator. Mr. Moore will specialize in industrial plant problems and electric furnace installations with which the "Moore" electric power regulator is closely allied.

Gannett, Seelye & Fleming, Engineers, Inc., Harrisburg, Pa., and Memphis, Tenn., engineering, appraisals, construction and management, announce that an office has recently been opened at 52 Wall Street, New York.

The Flexible Steel Lacing Company, 4607 Lexington Street, Chicago, announces that its line of "Flexco" and "Flexco-Lok" expanded metal lamp guards have been revised to a series of only thirty-four numbers and that prices on the line have been reduced.

The Sangamo Electric Company, Springfield, Ill., meter manufacturer which recently opened up a direct sales office in Boston in charge of Stafford J. King, announces that Leonard G. Hunt has been transferred to Boston and will be associated with Mr. King. Mr. Hunt, both prior and subsequent to his graduation from the University of Illinois, was associated with the company and for the last three years has been a district sales engineer with headquarters at the factory.

New Equipment Available

Copper-Bearing Steel Poles

A steel pole manufactured from copper-bearing steel has been placed on the market by the Truscon Steel Company, Youngstown, Ohio. The use of copper-bearing steel is said to prevent rust and eliminates the galvanizing process. This new pole is made in the same way as the Truscon steel pole, which was placed on the market last year and which was described and illustrated in the June 21 issue of the ELECTRICAL WORLD. The pole consists of two structural-steel channels, each of which has the center portion of the web sheared and pressed out normal to the web. These pressed-out sections form approximately a triangle. The depth of the cuts are uniformly graded from top to bottom so that when the two channels are riveted together a tapered pole is formed in which the web members are virtually a double-intersection Warren type cantilever truss.

Portable Arc-Welding Machine

A motor-generator-type portable arc-welding machine, known as the "type S" and intended for production and repair service in foundries, steel mills, railroad and other shops, has been added to the line of the Wilson Welder & Metals Company, Inc., Wilson Building, Hoboken, N. J. The machine has a range of adjustment from 75 amp. to 250 amp. in small steps and is intended for rapid work using electrodes up to ¼ in. diameter.

The generator is of the field-control type, and the current regulation is such that when welding at full load the current does not rise over 10 per cent on short circuit. As ballast resistors are not employed and the windings are of low resistance, the voltage generated is practically that of the arc plus the drop in the welding leads. The machine is mounted on a welded channel-iron base equipped with roller-bearing steel wheels. It is 52 in. long, 40 in high, 30 in. wide over all, and weighs 1,260 lb.

Industrial Lighting Unit.—A watchman's circuit unit, known as the No. 830 and constructed on the two-piece refractor principle, has been placed on the market by the Holophane Glass Company, Inc., 342 Madison Avenue, New York. The light distribution of this unit is such that when the units are spaced on centers six times the mounting height uniform illumination will be obtained. For ordinary ceiling heights (10 ft. to 12 ft.) the units can be spaced on 60-ft. to 70-ft centers. The 75, 100 or 150-watt lamp can be used.

New Trade Literature

HEAVY-CURRENT RESISTOR.—Bulletin No. 107 issued by the Monitor Controller Company, 500 East Lombard Street, Baltimore, describes the "Monitor Edgewood" resistor. This new resistor is for heavy-duty service and possesses a number of advantages which are explained and discussed in this bulletin.

COMMUTATOR SMOOTHING STONES.—The Electric Service Supplies Company, Seventeenth and Cambria Streets, Philadelphia, has issued bulletin No. 207 describing the various types of the "Cass" commutator smoothing stones, which is a new name for the old "Aetna" smoothing stone. Attention is also called to its portable electric blowers, cyclone type.

STATOR AND FIELD-WINDING ASSEMBLY.—The Century Electric Company, St. Louis, is distributing a folder entitled "Stator and Field Winding Assembly" in which it describes and illustrates the stator and field-winding assembly of the "Century" polyphase squirrel-cage induction motor.

ELECTRIC CRANE EQUIPMENT.—The General Electric Company, Schenectady, N. Y., has issued an illustrated booklet entitled "Electric Equipment for Cranes," in which it discusses the subject with particular reference to crane motors and control, brakes, etc. Information is given on operating characteristics. Types of standard motors are listed, together with other data.

BRASS ROD. — The Bridgeport Brass Company, Bridgeport, Conn., has issued a chart called the "Bridgeport Ledrite Rod-O-Graph," which permits the ready calculation of the gross weight of a number of pieces cut from round, hexagonal, octagonal or square brass rod. The chart is intended as a time saver, particularly in figuring costs.

SPACE HEATER.—"Two Feet of Electrical Heat" is the title of a six-page pamphlet issued by the Cutler-Hammer Manufacturing Company, Milwaukee, which describes and illustrates the "C-H" space heater and some of its many uses, such as keeping vaults warm and dry, in negative drying cabinets, valve houses on fire sprinkler systems, etc.

PUMPING EQUIPMENT.—The De Laval Steam Turbine Company, Trenton, N. J., has issued a leaflet entitled "De Laval Pumps at Des Moines, Iowa," which describes and illustrates the De Laval pumping equipment in the pumping plant of the city of Des Moines.

SUMP PUMP.—The Goulds Manufacturing Company, Seneca Falls, N. Y., is distributing a circular calling attention to the Goulds Fig. 3,029 centrifugal sump pump for use in draining cellars, elevator pits, etc.

ELECTRICAL INSTRUMENTS. — The Weston Electrical Instrument Company, 4 Weston Avenue, Newark, N. J., has issued a circular which describes the Weston instruments especially adapted to radio production and research.

CONDENSER DATA.—A treatise on condenser performance based on data secured from actual installations has been compiled by the Ingersoll-Rand Company, 11 Broadway, for a limited distribution. It contains a report by Dean A. A. Potter on his study of actual installations, a report of Paul Bancel to the N. E. L. A. prime movers committee and other miscellaneous information. A study of this pamphlet gives some extremely valuable aids on the choice, installation and operation of surface condensers.

WELDED WIRE.—The Copperweld Steel Company, Braddock Post Office, Rankin, Pa., is distributing a leaflet describing its Aristos "Copperweld" wire, made by the molten welding process.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Bahia, Brazil (No. 13,070), for electrical supplies.

An agency is desired in Milan, Italy (No. 13 104), for refrigerating machinery.

An agency is desired in Tokyo, Japan (No. 13,108), for refrigerating machinery.

REORGANIZATION OF PUBLIC UTILITIES IN MACEIO, BRAZIL.—Plans are under consideration to reorganize and consolidate the four companies now supplying street car service, electricity, telephone service and water supply in Maceio, Brazil, according to *Commerce Reports*. Further particulars may be obtained from the Electrical Division, Bureau of Foreign and Domestic Commerce, Washington, D. C., by referring to No. 153,963.

New Incorporations

THE RICHTON (MISS.) LIGHT & POWER COMPANY has been incorporated with a capital stock of $10,000 by C. H. Stevens and others.

THE TOMPKINSVILLE (KY.) POWER COMPANY has been chartered with a capital stock of $25,000 by S. T. Hagan, B. L. Bradshaw and E. E. Palmore.

THE CAROLINA MOUNTAIN POWER COMPANY, Asheville, N. C., has been incorporated by C. W. Tillett, Jr., D. W. Spencer and C. L. McLean, all of Charlotte. The company is capitalized at $1,000,000 and proposes to build a hydro-electric plant.

THE MADISON (VA.) POWER COMPANY has been chartered with a capital stock of $100,000. The officers are A. H. Cave, president, and J. B. Fray, secretary.

THE FALLSTON (N. C.) ELECTRIC LIGHT & POWER COMPANY has been chartered by J. H. Green, Claude R. Falls, R. A. Lackey, D. M. Cline, all of Fallston, and O. C. Dixon and O. M. Mull of Shelby. The company is capitalized at $50,000 and proposes to erect a transmission line from Shelby to Fallston.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

PORTSMOUTH, N. H.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Jan. 21 for electrically driven capstans at the local navy yard.

BOSTON, MASS.—The Edison Electric Illuminating Company is considering laying submarine conduit cables in the Mystic River at and near Chelsea Bridge South.

CHICOPEE, MASS.—The Board of Aldermen has granted the Turners Falls Power & Electric Company permission to erect overhead wires on McKinley Avenue and to lay an underground cable on Olivigne and Newton Streets.

Middle Atlantic States

ASHFORD, N. Y.—The Public Service Commission has authorized the Olean (N. Y.) Electric Light & Power Company to extend its transmission line in the town of Ashford and to exercise a franchise granted by the Town Board.

BRONXVILLE, N. Y. — The Lawrence Park, Heat Light & Power Company has applied to the Public Service Commission for permission to construct an electric plant and a steam heating plant in Bronxville.

BROOKLYN, N. Y.—The Brooklyn Edison Company, Inc., has filed plans for the construction of a substation at 2502-12 Tilden Avenue, to cost about $85,000.

GLENS FALLS, N. Y.—The machine and repair shop connected with the hydro-electric plant of the International Paper Company on Sherman Island, 6 miles north of Glens Falls in the Hudson River, was recently destroyed by fire, causing a loss of about $50,000.

NEW BRIGHTON, N. Y. — The Staten Island Rapid Transit Railway Company has filed plans for the construction of a substation at South Beach near Sand Lane, to cost about $18,000. The company also plans to build two other substations, one to be located near the Old Town Road, Glasmere, and the other near James Street, Atlantic, to cost about $16,000 each.

NEW YORK, N. Y.—Improvements are contemplated by the Bureau of Yards and Docks, Navy Department, Washington, D. C., at Dry Dock No. 4, including replacing high-tension electric cable, improvements to gas plant and distributing system, etc.

NEW YORK, N. Y.—Bids will be received by the Superintendent of School Buildings, Board of Education, corner of Flatbush Avenue Extension and Concord Street, Brooklyn, until Jan. 27 for electric wiring and fittings and gas and electric fixtures for new Public School 86, corner Reservoir Avenue and West 195th Street, Borough of the Bronx.

NIAGARA FALLS, N. Y.—The Mathieson Alkali Works, Inc., is planning to install electric power equipment in connection with proposed extensions in its local liquid chlorine plant, to cost about $250,000.

PERRY, N. Y.—The Public Service Commission has granted the New York Central Electric Corporation permission to extend its lines in the town of Erwin and Sparta, and for transmission purposes only in a portion of the town of Bath.

RYE, N. Y.—Negotiations are under way by the Board of Trustees and the Westchester Lighting Company, Mount Vernon, for the installation of an ornamental lighting system on Purchase Street.

ST. GEORGE, N. Y.—The New York-New Jersey Superpower Connecting Corporation, organized under the laws of New Jersey for the purpose of generating electricity and erecting transmission lines for the interchange of power between corporations in New York and New Jersey, has applied for permission to acquire control of the Staten Island Edison Corporation. The Superpower corporation proposes to contract with the Staten Island corporation for an interchange of power.

SCHENECTADY, N. Y.—The Adirondack Power & Light Corporation has issued $500,000 in capital stock, part of the proceeds to be used for extensions and improvements, including line extensions.

NEWARK, N. J. — The Newark Sugar Refining Company is planning to equip its proposed sugar mill at Port Newark, for electrical operation throughout. A substation will be installed. The cost of the entire plant is estimated at $5,000,000. Adolph Segal, Pennsylvania Building, Philadelphia, is interested in the project.

HARRISBURG, PA.—The City Council has authorized improvements in the street-lighting system, including the replacement of all cluster lamps with single 500-watt lamps on Third, Walnut, Fourth, Locust and other streets.

PITTSBURGH, PA.—Officials of the Bell Telephone Company have announced that approximately $31,000,000 will be expended during 1925 for improvements and extensions in lines to its system in Pennsylvania.

ROYALTON, PA.—The Borough Council has authorized the construction of a transmission line for service in neighboring sections of Londonderry Township from the municipal electric power station.

SCHNECKSVILLE, PA.—The installation of a street-lighting system throughout the village during 1925 is under consideration by the Board of Village Trustees.

BALTIMORE, MD. — The Consolidated Gas, Electric Light & Power Company is arranging a fund of about $7,750,000 for extensions and improvements to its system during 1925.

CONOWINGO, MD.—The Federal Power Commission has granted the Susquehanna Power Company, Bel Air, Md., a license to build a large hydro-electric project near Conowingo. Plans for the initial installation provide for an output of about 280,000 hp. and an ultimate capacity of 480,000 hp. to cost about $52,000,000. The dam will be 3,680 ft. long and 103 ft. high. The transmission line will be 55 miles in length, 45 miles of which will be in Pennsylvania. Boyd Ehle, Conowingo, is engineer.

WASHINGTON, D. C.—Bids will be received by the Chief of the Bureau of Yards and Docks, Navy Department, Washington, until Feb. 18, for one 210 ft. radio tower at Cavite (Specification 5057).

WASHINGTON, D. C.—Bids will be received at the office of the Chief Engineer of Air Service, United States Army, Washington, until Jan. 20, for 20,000 ft. steel cable, $\frac{1}{8}$ in. in diameter (Circular CAS 76).

WASHINGTON, D. C.—Bids will be received by the General Purchasing Officer, Panama Canal, Washington, until Jan. 30, for a quantity of electrical equipment, including watt-hour meters, motors, lighting arresters, fuses, switches, lamp cord, etc. (Panama Circular 1650).

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until Jan. 27, for a quantity of lamp cord, rubber-insulated and armored wire, magnet wire, etc., for Eastern and western yards (Schedule 3140).

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, Washington, until Jan. 24, for one cable perforator, one solenoid and frame, one condenser unit, one set of parts to change keyboard perforator and one terminal block (Circular CP. 15058-L-S).

WASHINGTON, D. C.—Plans are being considered by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for moving power-plant equipment, drydock and water tank, etc., from Olongapo to the Cavite (P. I.) naval station. The installation of oil engines at the naval station at Virgin Islands, St. Thomas, is also under consideration.

North Central States

CARO, MICH.—The Great Lakes Power Company has secured permission to consolidate a number of its smaller properties and is said to be planning transmission-line extensions and improvements. The company will change its name to the Michigan Electric Power Company.

DETROIT, MICH.—The Detroit Edison Company contemplates extensions and improvements during 1925, to cost about $16,000,000, to include an extension to the Trenton Channel generating plant, increasing the output to 150,000 kw., substations in Detroit and vicinity, transmission lines, etc.

JACKSON, MICH. — The Consumers' Power Company contemplates extensions and improvements during 1925 in this section, to cost about $1,000,000, including transmission line extensions, substations, etc.

CLEVELAND, OHIO.—An ordinance has been introduced in the City Council providing for the installation of ornamental lamps on portions of Kinsman and Woodland Avenues.

CLEVELAND, OHIO.—The City Council has authorized a survey and an estimate of the cost of installing an ornamental lighting system on Hough, Lexington and Wade Park Avenues.

MILLERSBURG, KY. — The Kentucky Utilities Company, Louisville, has secured an eight-year contract for street lighting and will install new lamps of 70 cp. and 80 cp. on the principal streets.

ANDERSON, IND.—Extensions and improvements in the municipal electric light and power plant during 1925, to include installation of additional equipment, are under consideration by the City Council.

PENDLETON, IND. — The Board of Trustees, Indiana State Reformatory, has authorized plans for emergency electric lines and a yard lighting system at the institution in connection with other improvements to be made during 1925.

DECATUR, ILL.—Plans have been completed for the construction of a power plant, to cost about $35,000, for local school service. Brooks, Bramhall & Dague, National Bank Building, Decatur, are architects.

GREAT LAKES, ILL.—Improvements to the power plant at Great Lakes Naval Training Station are under consideration by the Bureau of Yards and Docks, Navy Department, Washington, D. C.

HUSTISFORD, WIS.—Plans are under way by the Hustisford Light, Power & Manufacturing Company for the construction of a concrete dam and alterations to its power plant, to cost about $15,000. The Power Engineering Company, Metropolitan Life Building, Minneapolis, is engineer.

ST. PAUL, MINN.—The replacement of 2,100 gas lamps with electric lamps has been recommended to the City Council by Commissioner Sudheimer. The electric lamps will be installed on Central Park Place between Summit and Central Avenues and on Summit Avenue between Central Park Place east and west. The cost is estimated at $3,250.

DUBUQUE, IOWA.—The board of directors of St. Anthony's Home for the Aged, Davis Street and Windsor Avenue, contemplates rebuilding the power house at the institution, recently destroyed by fire with loss of about $90,000.

LEWIS, IOWA.—The Iowa Service Company, Omaha, Neb., is perfecting plans to construct a 33,000-volt transmission line to connect with its systems at Lewis-Red Oak, and Avoca-Marne, Iowa.

MANSON, IOWA.—The plant and system of the Manson Light, Heat & Power Company, Inc., has been acquired by the Fort Dodge (Iowa) Gas & Electric Company. At present the local plant will be operated by the Fort Dodge company, which it is expected will erect a high-tension line from Fort Dodge to Manson.

VERONA, N. D.—The Village Council contemplates the installation of an electric lighting system, for which bonds have been authorized.

BELLEVUE, NEB.—Bonds to the amount of $5,000 have been voted for extensions in the municipal electric lighting system.

LINCOLN, NEB.—The Nebraska Gas & Electric Company is perfecting plans for the erection of a 66,000-volt transmission line between Lincoln and Plattsmouth.

KANSAS CITY, KAN.—The Kansas City Steel & Wire Company plans to install electric power equipment at its proposed plant at Twelfth Street and the Terminal Tracks. The cost is estimated at $500,000.

QUINTER, KAN.—Application has been made to the Public Utilities Commission for permission to sell the municipal electric light plant and to grant a franchise to the Central Power & Light Company, Concordia.

Southern States

ASHEVILLE, N. C. — The Asheville Power & Light Company is planning to build a street-car line from Biltmore Avenue on the Black Mountain Highway to the Oteen Veterans' Hospital, a distance of 6 miles.

STONEVILLE, N. C. — The Stoneville Cabinet Company, recently organized, plans to build an electric power plant at its proposed local cabinet and woodworking plant. D. C. Kickler is secretary.

LAKE CITY, S. C.—The South Carolina Power & Light Company, Kingstree, which recently acquired the local municipal electric plant and ice plant, plans extensions and improvements to the system.

FORT LAUDERDALE, FLA. — At an election to be held on Jan. 24 the proposal to issue $40,000 in bonds for extensions and improvements to the lighting system will be submitted to the voters.

MIAMI, FLA.—Plans are under way by the South Florida Cold Storage & Ice Company, recently organized, to install electric power equipment in its proposed local cold-storage and ice manufacturing plant, to cost about $1,000,000.

HOLLYWOOD, FLA.—Plans are being considered by the Hollywood Electric Company for extensions to its power station, including the installation of a steam-turbine-driven generating unit.

TUSCALOOSA, ALA. — The Tuscaloosa Lumber Company is planning to install a 200-kw. to 300-kw. generator, with accessories, at its power station.

MOUNTAIN HOME, ARK.—The installation of a 75-hp. combustion engine is under consideration by Wyatt H. Wolf, owner of the local electric plant.

MANSURA, LA.—Bonds to the amount of $50,000 have been voted for the installation of an electric plant and waterworks system.

WETUMKA, OKLA.—Bids will be received by Charles N. Hamilton, city clerk, until Jan. 21, for equipment for the municipal electric power plant and waterworks, including two 200-hp. oil-engine-driven generator sets, complete with switchboard apparatus, storage tanks, etc.; one 350-gal.-per-minute and one 250-gal.-per-minute motor-driven pumping units, etc.; one 500-gal.-per-minute marine engine unit; filter equipment, etc. V. V. Long & Company, Colcord Building, Oklahoma City, are engineers.

SANTA ANA, TEX.—The West Texas Utilities Company, Abilene, contemplates extensions and improvements in the power plant of the Santa Ana Utilities Company, recently acquired.

Pacific and Mountain States

ABERDEEN, WASH.—A special election will be held on March 24 to vote on the proposal to issue $700,000 in bonds for acquiring 1,000 acres at the head waters of the Wynooche River and constructing a 120-ft. dam and a 1,000-hp. pumping station as an extension to the municipal power, light and water system.

EVERETT, WASH.—The construction of an outdoor-type substation in Everett is provided for in the $9,000,000 budget of the Puget Power & Light Company, Seattle, for proposed extensions and improvements already made. The station will be erected in Everett and will be located at the end of the 110,000-volt transmission line from the Baker River plant, now under construction.

BUTTE, CAL.—Plans have been prepared by the Butte City Ranch for irrigating, 2,550 acres of land. The work will include five pumping plants, equipped with centrifugal pumps with 50-hp. motors, from 80,000 linear ft. to 100,000 linear ft. of concrete pipe, 4 miles of transmission line, etc.

LOS ANGELES, CAL.—The City Council has adopted an ordinance providing for the installation of ornamental lamps on Sixth Street from Loomis to Vermont Avenue.

LOS ANGELES, CAL.—Extensions and improvements to cost about $9,750,000 will be carried out by the Municipal Power Bureau during 1925 to meet the increasing demand for electrical service. Of this about $5,975,000 will be expended for extensions and betterments on the system within the city which distributes electricity to individual consumers. E. F. Scattergood is engineer of the bureau.

MONTEBELLO, CAL.—The Associated Oil Company, Los Angeles, has secured a franchise for the construction and operation of a private telephone line on several streets here.

SAN FRANCISCO, CAL.—A construction program calling for an expenditure of $33,721,000, of which $17,821,000 will be spent during 1925, has been announced by the Pacific Gas & Electric Company. The work includes the construction of Pit River No. 4 plant, which includes a 135,000-hp. power house, a 4-mile tunnel, large diversion dam, three penstock lines, to cost about $2,500,000; a new substation in the Shasta division at Cottonwood to take care of power from the lines of the California-Oregon Company; reconstruction of substations at Red Bluff, Roseville and Livermore; new work in the Sacramento district, including the installation of a large condenser, $900,000); new substation in San Francisco, $660,000 and new feeder lines, $236,000; expenditure for extensions to the gas department, $5,500,000.

SAN RAFAEL, CAL.—Property owners on Lincoln Avenue are considering the question of installing electroliers along that thoroughfare.

SOUTH PASADENA, CAL. — The City Council has rejected all bids recently received for the installation of an ornamental lighting system on Bonita Drive, West and East Mission Streets. It is expected to ask new bids in the near future.

TOMBSTONE, ARIZ.—Contract has been awarded to Jules Vermeersch for designing and building the proposed municipal electric lighting, ice plant and electric distributing system.

DENTON, MONT.—The Montana Power Company, Butte, has preliminary plans to erect a transmission line from Stanford to Denton, to cost about $22,000.

MISSOULA, MONT. — The Gold Coin Mining Company, Butte, has applied to the Federal Power Commission for a license to erect a transmission line in Granite County in the vicinity of Missoula and Anaconda.

SIDNEY, MONT.—The Midland Sugar Company, recently formed by officials of the Holly Sugar Company, Kittredge Building, Denver, Col., plans to build a power house at its proposed local beet-sugar mill, to cost about $1,000,000. The mill will be equipped with electrically operated machinery.

DENVER, COL.—The City Council has authorized the erection of sixty arc lamps at various street intersections and the replacement of twenty others with lamps of greater candlepower.

PUEBLO, COL.—The Colorado Fuel & Iron Company plans to replace all steam-operated equipment with electrically operated machinery in its local steel mills. The cost is estimated at $3,000,000.

Canada

PORT CREDIT, ONT.—The Hydro-Electric Power Commission, Toronto, is planning to rebuild the radial railway from Port Credit to Humber River, 15 miles long, at a cost of about $700,000.

TORONTO, ONT. — Engineers of the Ontario Hydro-Electric Power Commission who have been investigating possibilities of diverting water from Hudson Bay into the St. Lawrence watershed, in order to increase the water power at various points where power plants are situated or may be built, have reported favorably on the proposition.

MONTREAL, QUE.—The City Council is considering improvements to the fire-alarm system, to cost about $1,000,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued December 23, 1924)

1,520,145. THERMOSTATIC CIRCUIT CLOSER; Joseph H. Scharff, Nutley, N. J. App. filed July 29, 1918.

1,520,169. CIRCUIT CLOSER FOR ALARMS; Harry Cappellanti, Morgantown, W. Va. App. filed Nov. 28, 1923. Automatic gas-flow alarm.

1,520,174. ELECTRIC HEATING DEVICE; Nelson O. Clark, Texarkana, Ark. App. filed May 16, 1923. Induction type.

1,520,193. SWITCHING DEVICE; Walter B. Manson, East Orange, N. J. App. filed April 25, 1921. With visual signaling device to indicate position of switch.

1,520,201. FUSE; John N. Nenonen, Aberdeen, Wash. App. filed June 19, 1923. With telltale device.

1,520,206. MEASURED-SERVICE TELEPHONE SYSTEM; William W. Owen, Oak Park, Ill. App. filed Jan. 3, 1920.

1,520,218. INSULATOR BRACKET; Thomas H. Barnard, Toronto, Ontario, Canada. App. filed Aug. 3, 1922.

1,520,237. DYNAMO - ELECTRIC MACHINE; Clarence F. Gilchrist, Toledo, Ohio. App. filed March 4, 1920. Inclosed type, as used in motor vehicles.

1,520,241. ELECTRIC HEATER; Arthur H. Happe, Detroit, Mich. App. filed Feb. 6, 1922. Portable.

1,520,268. AUTOMATIC TELEPHONE SYSTEM; John Wicks, Chicago, Ill. App. filed Oct. 23, 1920.

1,520,308. ELECTRIC SWIVEL CONNECTION; Bruno E. Quadri, Chicago, Ill. App. filed July 31, 1922.

1,520,321. ELECTRIC COOKER OR HEATING UNIT; George H. Bindon, Ottawa, Ontario, Canada. App. filed Feb. 16, 1923.

1,520,327. ELECTRICAL AGRICULTURAL SYSTEM; Gunnar E. Casel, Stockholm, Sweden. App. filed March 2, 1923. Wire system for supplying current to electrically driven traction engines.

1,520,329. VARIABLE CONDENSER; Casimir S. Cherpeck, Chicago, Ill. App. filed Aug. 26, 1922. Adapted for radio work.

1,520,334. CONTROL FOR BATTERY-CHARGING PLANTS; Francis W. Cress, Prior Lake, Minn. App. filed April 28, 1922.

1,520,394. SIGNAL DEVICE; Clarence E. Beach, Binghamton, N. Y. App. filed Dec. 7, 1920. Adapted for alarm systems.

1,520,406. ELECTRIC SWITCH; Claude W. Denny, London, England. App. filed June 24, 1922. Quick-break action; knife-blade type, for flatirons, etc.

1,520,417. INDICATOR; Joseph Hubicki, Detroit, Mich. App. filed Dec. 12, 1921. For use in vehicles to indicate an approaching street or station.

1,520,420. BATH CABINET; Robert J. Kideney and Sylvia L. Kideney, Buffalo, N. Y. App. filed Sept. 6, 1921. Collapsible with electric heat.

1,520,421. ELECTRICAL CONNECTOR AND SUPPORTING DEVICE; Frank E. Kolar, St. Paul, Minn. App. filed June 21, 1921. Attachment-plug type.

1,520,452. PANELBOARD; Henry F. Starrett, Chicago, Ill. App. filed April 9, 1920. Sectionalized.

1,520,453. ELECTRICALLY CONTROLLED TIMEPIECE; Lewis J. Stern, New York, N. Y. App. filed March 23, 1921.

1,520,454. REMOVABLE CONTACT TIP; Raymond Swartz, Harrisburg, Pa. App. filed July 13, 1922. For controllers or switching devices.

1,520,473. PORTABLE LAMP; Arthur C. Kleckner, Racine, Wis. App. filed Jan. 27, 1922. With magnetic base.

1,520,478. SYSTEM OF OPERATION OF AUTOMATIC TYPEWRITERS AND DEVICES THEREOF; Robert W. More, Chicago, Ill. App. filed April 2, 1921.

1,520,485. STATIC-ELECTRICITY GROUNDING DEVICE; Frank C. Singleton, Chicago, Ill. App. filed March 27, 1924.

1,520,495. STORAGE-CELL COVER; Wilfred K. Fleming and Albert M. Baehr, Lakewood, Ohio. App. filed March 19, 1923. For small round cylindrical type cell.

1,520,499. QUICK - ACTING THERMOSTAT; Axel Johnson, Oakland, Cal. App. filed Nov. 19, 1923.

1,520,501. ELECTRICAL FOOD AND BEVERAGE PREPARING DEVICE; Milton M. Kohn, New York, N. Y. App. filed Jan. 22, 1921.

1,520,503. COUPLING FOR ELECTRICAL CONDUCTORS; David B. Mills, Montclair, N. J. App. filed April 19, 1923.

1,520,561. FUSE PLUG; Thomas F. Cote, Montreal, Quebec, Canada. App. filed April 26, 1921. Renewable.

1,520,580. ELECTROMAGNETIC-WAVE SIGNALING SYSTEM; Norman Lea, Coventry, England, and John Ree, Pinner, England. App. filed Sept. 26, 1919.

1,520,587. STORAGE BATTERY; James F. McCauley, Cleveland, Ohio. App. filed June 3, 1922. With electrodes of cylindrical form, concentrically arranged.

1,520,640. THERMIONIC DEVICE; George L. Geisey, Steubenville, Ohio. App. filed Nov. 20, 1922. Vacuum tube.

1,520,661. RADIOJACK; Ray H. Manson, Rochester, N. Y. App. filed June 9, 1922.

1,520,675. BATTERY TERMINAL; George E. Harper, Gainesville, Tex. App. filed Oct. 9, 1923.

1,520,676. RIM-PLATING MACHINE; Harry K. Koppin, Jackson, Mich. App. filed June 25, 1923.

1,520,678. ELECTRIC STARTING, STOPPING AND DETECTING DEVICE; Anthony A. Vorndieke, Cincinnati, Ohio. App. filed Oct. 2, 1922. For motors, fans, lighting systems, etc., and applicable to wireless radio systems.

1,520,680. ELECTRICAL CONDUCTOR; Charles W. Abbott, Hartford, Conn. App. filed March 16, 1923. Duplex lighting cable.

1,520,682. BATTERY-CHARGING SYSTEM; Frederick J. Hardman, Dayton, Ohio. App. filed Feb. 16, 1920. For farm-lighting plant.

(Issued December 30, 1924)

1,520,724. ELECTRODE OF ACCUMULATORS; Otto Schneider, Dresden, Germany. App. filed Dec. 8, 1919. In which the outer electrode envelops or extends entirely about the inner electrode.

1,520,738. ELECTRIC LIGHT; Louis Yablin, Chicago, Ill. App. filed Oct. 18, 1923. With a plurality of light sockets that are adjustable.

1,520,793. CURRENT-REGULATING DEVICE; Rowland L. Young, East Orange, N. J. App. filed May 26, 1921. For controlling the charging current of a storage-battery system.

1,520,813. SELECTIVE CIRCUITS FOR MULTIPLEX TRANSMISSION; Lloyd Espenschied, Hollis, N. Y. App. filed Sept. 23, 1919.

1,520,821. AUTOMATIC SWITCH; William Kaisling, Chicago, Ill. App. filed July 9, 1920. Step-by-step type.

1,520,835. METHOD OF RECEIVING ELECTRICAL OSCILLATIONS; Alexander Meissner, Berlin, Germany. App. filed Sept. 3, 1921. Wireless telegraph.

1,520,847. ELECTRIC SWITCH; James H. Bartholomew and Raymond H. Boardman, Meriden, Conn. App. filed July 17, 1923. Toggle type.

1,520,850. DEPOSITING PLATE FOR LEAD-MOLD IMPRESSIONS; Anthony S. Boyer, St. Paul, Minn. App. filed July 3, 1923.

1,520,865. APPARATUS AND METER FOR TESTING BATTERIES; Benjamin F. W. Heyer, Montclair, N. J. App. filed Sept. 21, 1922.

1,520,868. ELECTRIC GROUND CLAMP; Raymond M. Hutton, Philadelphia, Pa. App. filed Jan. 27, 1921.

1,520,889. SEPARATOR FOR ELECTRIC BATTERIES; Virgil B. Sease, Parlin, N. J. App. filed July 8, 1920.

1,520,906. AUTOMATIC CONTROL SYSTEM FOR SYNCHRONOUS MOTOR-GENERATOR SETS; Stuart G. Leonard, Galion, Ohio. App. filed Jan. 8, 1923.

1,520,909. AUTOMATIC TELEPHONE SYSTEM; Winfred T. Powell, Rochester, N. Y. App. filed July 15, 1919.

1,520,910. CALLING DEVICE; Charles D. Richard, New Brighton, N. Y. App. filed Dec. 14, 1920. By which separate groups of impulses may be transmitted as in automatic telephony.

1,520,913. ELECTRIC SOLDERING IRON AND METHOD OF MAKING THE SAME; Maurice Simon, St. Louis, Mo. App. filed Oct. 16, 1922.

1,520,973, 1,520,974. SPEED - REGULATOR SYSTEM; Stephen A. Staege, Pittsburgh, Pa. App. filed Sept. 2, 1921. Adapted to maintain a substantially constant speed ratio between a plurality of moving members.

1,520,984. ELECTRIC INSULATOR; Percy H. Thomas, Upper Montclair, N. J. App. filed Aug. 29, 1913. High-tension.

1,520,990. MULTI-OFFICE TELEPHONE SYSTEM; John Wicks, Chicago, Ill. App. filed Jan. 20, 1922.

1,520,994. ELECTRON-DISCHARGE AMPLIFIER; Harold D. Arnold, Maplewood, N. J. App. filed Sept. 3, 1915. Arrangement and method of varying the ratio of amplification.

1,520,997. SAFETY SWITCH BOX; Harold G. Baxter, Baldwin, N. Y. App. filed April 9, 1920.

1,520,999. ELECTRIC FURNACE; Clarence A. Boddie, Pittsburgh, Pa. App. filed Sept. 11, 1920. Movable-electrode type of relatively large capacity.

1,521,002. TEMPERATURE CONTROL FOR ELECTROLYTIC CELLS; Porter H. Brace, Pittsburgh, Pa. App. filed Nov. 13, 1919.

1,521,003, 1,521,004, 1,521,005. REGULATOR SYSTEM; William M. Bradshaw and John H. Ashbaugh, Wilkinsburg, Pa. App. filed July 20, 1922. System of control for a plurality of dynamo-electric machines; combined governing and regulating means.

1,521,006. INDUCTION-REGULATOR SYSTEM; Kay Christiansen, San Francisco, Cal. App. filed Sept. 2, 1921.

1,521,007. RECORDING METER; Lewis W. Chubb, Edgewood Park, Pa. App. filed Jan. 20, 1921.

1,521,009. SWITCH MECHANISM; Ora A. Colby, Irwin, Pa., and Earl W. Denman, Swissvale, Pa. App. filed Dec. 2, 1920. Of the knife-blade type.

1,521,015. CONTROL SYSTEM; Thomas Ferguson, Bowdon, England. App. filed March 16, 1923. For regulating the excitation of the motor-field windings when the motors are regenerating.

1,521,016. QUICK-ACTING KNIFE SWITCH; Frank F. Forshee, Flint, Mich. App. filed Nov. 20, 1919.

1,521,017. ELECTRICAL DISTRIBUTING SYSTEM; Charles Le G. Fortescue, Pittsburgh, Pa. App. filed May 14, 1921. Alternating-current distributing systems with special relation to phase-modifying means whereby polyphase apparatus may be operated from single-phase power-supply circuits.

1,521,018. SIGNALING SYSTEM; Howard L. Godfrey, Wilkinsburg, Pa. App. filed June 3, 1920. Wireless telegraphy.

1,521,019. TELEPHONE SYSTEM; Charles L. Goodrum, New York, N. Y. App. filed April 17, 1920. Combined manual and automatic.

1,521,028. RESISTOR FOR ELECTRIC FURNACES; George M. Little, Pittsburgh, Pa. App. filed May 24, 1921.

1,521,031. ELECTRICALLY HEATED SOLDER POT; Allis M. MacFarland, Wilkinsburg, Pa. App. filed July 19, 1921.

1,521,032. ELECTRICAL MEASURING INSTRUMENT; Paul MacGahan, Pittsburgh, Pa., and Harry P. Sparkes, Edgewood Park, Pa. App. filed Oct. 2, 1919. Direct-current instrument of the moving-vane type.

1,521,102. CONNECTOR FOR ELECTRIC CABLES; Corwill Jackson, Kalamazoo, Mich. App. filed March 14, 1922.

1,521,130. ADAPTER FOR ELECTRICAL FIXTURES; Edmund O. Schweitzer, Chicago, Ill. App. filed Sept. 9, 1920.

1,521,142. ELECTRIC ATTACHMENT PLUG; O. S. Wright, Philadelphia, Pa. App. filed March 2, 1920. Readily disassembled.

1,521,159. TELEPHONE SYSTEM; Hugh D. MacPherson, Summit, N. J. App. filed Dec. 22, 1920. For controlling the transmission of current impulses for a plurality of trunk lines extending between widely separated offices.

1,521,160. TOLL-SWITCHING SYSTEM; Hugh D. MacPherson, Summit, N. J. App. filed April 18, 1921.

1,521,173. ELECTROMAGNETIC TOOL; Roy W. Catching, Roseburg, Ore. App. filed March 12, 1921. For recovering articles of magnetic material.

1,521,176. CUT-OUT; Neal W. Frank, Vinita, Okla. App. filed June 7, 1922. For automatically grounding a generator to prevent burning out in event of sticking of the ordinary regulator cut-out.

1,521,188. PHOTOGRAPHING OSCILLATING SPARKS; Charles F. Jenkins, Washington, D. C. App. filed Aug. 30, 1922. For broadcasting of photographs and motion pictures by radio.

1,521,189. FILM RECEPTION OF BROADCASTED PICTURES; Charles F. Jenkins, Washington, D. C. App. filed Aug. 30, 1922.

1,521,190. DRUM-LENS CARRIER; Charles F. Jenkins, Washington, D. C. App. filed Sept. 11, 1922. For broadcasting and receiving motion pictures by radio.

1,521,191. PRISM-LENS DISK; Charles F. Jenkins, Washington, D. C. App. filed Sept. 11, 1922. For the transmission of pictures by radio.

1,521,192. ELECTROSCOPE PICTURE RECEPTION; Charles F. Jenkins, Washington, D. C. App. filed Sept. 11, 1922. Transmission of pictures by radio.

1,521,197. CLASP FOR ELECTRICAL CONDUCTORS; Earle B. Lewis, Waterbury, Conn. App. filed Aug. 27, 1923.

1,521,199, 1,521,200. CONDUCTOR SUPPORT; Samuel S. Matthes, Mansfield, Ohio. App. filed Sept. 30, 1924. For trolley conductors.

1,521,205. SYNCHRONIZING ROTATING BODIES; William S. Stephenson and George W. Walton, London, England. App. filed March 24, 1924. In "wired wireless" systems.

Financial and Corporate

Utility Stocks Waver

Market Becomes Hesitant and Dull, but Price Losses Generally Are Small

GENERAL statements about the trend of the market in power and light stocks have become more difficult in the last fortnight for the simple reason that the movement has been mixed. While new investors have bought stocks in considerable volume, traders have in many instances been taking the large profits held by them "on paper" heretofore. Thus prices have moved fractionally forward and backward without establishing any very conclusive direction. The remarkable thing about the whole situation is, perhaps, that values have remained as firm as they have since the beginning of the year in view of the technical conditions of the market. The reason doubtless lies in part in the fact that companies in recent months have been doing a much larger business and prospects are bright for 1925.

The publication by the North American Company, for example, of its weekly kilowatt-hour output figures covering the last half of 1924 attracted considerable attention. The figures show an especially sharp upturn since election, and the company's stock, on publication of the figures, turned somewhat stronger than it had been in recent weeks. American Water Works & Electric Company's stock, on the other hand, was reactionary for a time last week, selling as low at one time as 35¼. Federal Light & Traction common, another listed stock, sold as low as 114½ earlier in 1925, but now has moved forward to 137 under active accumulation as various rumors have been spread of a possible change in the company's financial structure.

Among the unlisted issues the stock of the new company that is to control the Electric Bond & Share Company has been by far the most active. The shares after selling two weeks ago as high as 108 and then falling to 82 have now dropped another ten points.

New Capital Issues

Two large electric light and power offerings were made during the past week, consisting of a thirty-million-dollar note issue of the Edison Electric Illuminating Company of Boston and a fifteen-million-dollar issue of preferred stock of the Public Service Electric & Gas Company, Newark, N. J. The former — short-term securities dated January 15, 1925, and due January 15, 1928—were offered at 99.31 and accrued interest, yielding about 4.75 per cent. The proceeds of the issue will be used to pay off all existing coupon notes and other floating indebtedness and leave about $4,000,000 for future extensions of the property. The new issue of Public Service preferred stock was offered at a price of 95 and accrued dividends to yield 6.32 per cent. The Consumers Power Company floated an issue of 6.6 per cent cumulative preferred stock, amounting to $5,000,000, at $100 a share and accrued dividends from January 1, 1925, and the Southwestern Power Company a one-million-dollar issue of first mortgage bonds offered at 95½ and accrued interest, to yield over 6.40 per cent.

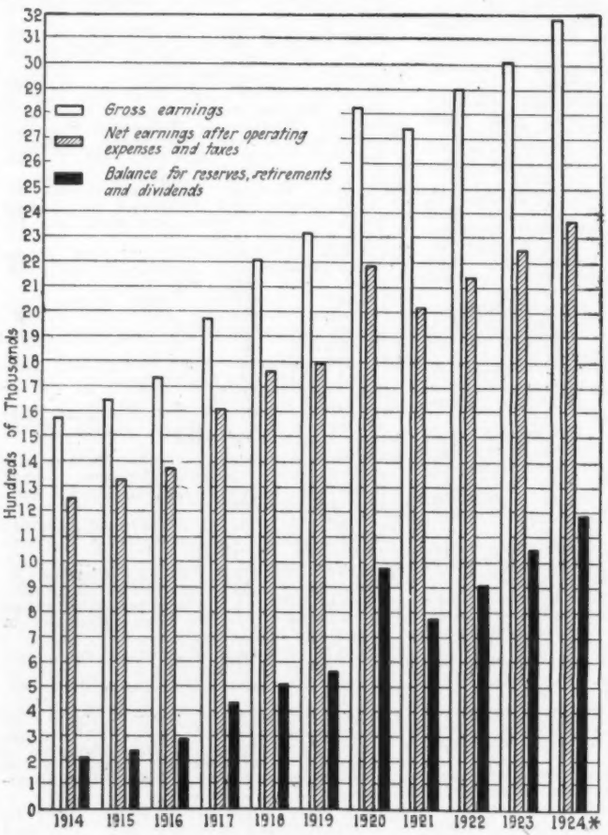
Also represented in the week's financing were the American Public Utilities Company, the Community Power & Light Company and the Iowa Southern Utilities Company with issues of 7 per cent cumulative preferred stock amounting to $1,000,000 in each case and the Knoxville Power & Light Company with an offering of 5,000 shares of 7 per cent cumulative preferred.

Mississippi River Power Company

Steady Improvement Has Been Shown from Operation of One of the World's Largest Hydro-Electric Plants that Sells Power Only at Wholesale

BY PAUL WILLARD GARRETT

THE Mississippi River Power Company, which owns and operates one of the largest hydro-electric plants in the world, spanning the Mississippi River at Keokuk, Iowa, does a business which differs in character somewhat from that done by the ordinary light and power company. Although the company has an installed generating capacity of 150,000 hp., no sales of energy are made at retail. The business is entirely wholesale.



EARNINGS OF MISSISSIPPI POWER COMPANY SHOW STEADY GROWTH
*Year ended November 30.

The company's most important contract for the sale of power, which is, incidentally, the one that was the basis for the construction of the magnificent property, is with the Union Electric Light & Power Company. This contract calls for 60,000 hp. and runs for a ninety-nine-year period. Rates for power obtained by the Mississippi River Power Company under this contract are subject to adjustment every ten years in accordance with variations in the price of coal. Most of the other contracts run for periods of ten years or less.

That the company's earnings should be comparatively stable is what would be expected from the fact that the most important customers are public utility companies. Perhaps no more than fifteen or twenty customers of importance now appear on the list of the Mississippi River Power Company, some of them being public utility and some industrial companies. Earnings from the public utility companies constitute, however, more than 70 per cent of the entire business. The company thus benefits from the diversity of enterprise to be found in the territory tributary to the Mississippi River between St. Louis and Burlington, Iowa.

The company distributes energy over an extensive transmission system covering an area of 14,000 square miles,

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stocks is $100.

Companies	Bid Price Saturday, Jan. 10	Low 1924	High 1924
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	a 99	94	99
Appalachian Power, 7 per cent	a 93	85½	93
Arkansas Light & Power 7 per cent	a 93	81	96
Asheville Power & Light 7 per cent	a 98	97	100
Central Illinois Public Service 6 per cent	a 85	84	88
Colorado Power 7 per cent	a 92	90	98
Connecticut Light & Power 7 per cent	a106	99	106
Consumers' Power 6 per cent	a 90	85	93
Dayton Power & Light 6 per cent	a 88	84	101
Duquesne Light 7 per cent	a105½	102	108½
Eastern Texas Electric 6 per cent	a 99	81	105
Empire District Electric 6 per cent	a 78	70	78
Fort Worth Power & Light 7 per cent	a 100	98	103
Great Western Power 7 per cent	a 99	96	99
Illinois Northern Utilities 6 per cent	a 87½	82	87
Illinois Power & Light 7 per cent	a 93	84	95
Kansas Gas & Electric 7 per cent	a 98	95	98
Long Island Lighting 7 per cent	a 100	95½	102
Minnesota Power & Light 7 per cent	a 96	96	98
Mississippi River Power 6 per cent	a 88	80	90
Nebraska Power 7 per cent	a 98	95	99
Niagara Falls Power—25	a 28½	27	29
Niagara, Lockport & Ont. Power 7 per cent	a104½	99	107
Northern States Power 7 per cent	a 95	91	97
Ohio Public Service 7 per cent	a 97	86	100
Pacific Gas & Electric 6 per cent	a 94	85	94
Penn-Ohio Power & Light 7 per cent	91	84	96½
Pennsylvania Power & Light $7—no par	a 99½	97	100
Penn. Public Service 7 per cent	a 90	90	100
‡Philadelphia Electric 8 per cent—25	a 43	29½	40
Southern California Edison 8 per cent	a 115	112	120
Tennessee Electric Power, 6 per cent	a 73	47	73½
Texas Power & Light 7 per cent	a 99½	97	100
Utah Power & Light 7 per cent	a 97½	96	99
Western States Gas & Electric 7 per cent	a 82	78	86
Yadkin River Power, 7 per cent	a 98	97	100
Holding Companies			
American Gas & Electric 6 per cent—50	a 45	41⅓	46
American Light & Traction	a 94½	91	94½
American Power & Light 6 per cent	a 88	84	91
American Public Service 7 per cent	a 88	84	95
American Public Utilities 7 per cent	a 88	73	88
American Water Works & Electric 7 per cent	a102	89½	101
Associated Gas & Electric 7 per cent—1 per cent extra—50	a 49½	42	52
Carolina Power & Light 7 per cent	a 100	95½	101
Central Indiana Power 7 per cent	a 88	80	93
Cities Service 6 per cent	a 80½	67	83
Commonwealth Power 6 per cent	a 81½	72	82½
Consolidated Gas 6 per cent—50	a 57½	51	59½
Continental Gas & Electric 7 per cent pr. pf.	a 90	69	93
Electric Bond & Share 6 per cent	a103	96½	104
General Gas & Electric—$8—no par	a105	96	105
*Middle West Utilities 7 per cent	a 93	80	94
National Power & Light—$7—no par	a 96	84	96½
North American 6 per cent—50	a 47	43½	50½
Northern Ohio Electric	a 23	16	34
Public Service Corp. of N. J. 7 per cent	a100½	96½	101½
Public Service Corp. of N. J. 8 per cent	110	99½	115
§tandard Gas & Electric 8 per cent—50	49	46½	50
‡United Gas Improvement—50	a 57½	55½	58
United Light & Power—$6.50—no par	83½	75¼	84
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	a 36	22½	37
Appalachian Power—no par	a 80	66	93
Arkansas Light & Power	a 60	22	63
Brooklyn Edison	a129½	107½	124½
Buffalo General Electric	a 43½(new)	118(old)	190(old)
Colorado Power	a 33	21	35
*Commonwealth Edison	a138½	126	136½
§Consolidated Gas, Electric Light & Power	a 33½	32½	37½
Dayton Power & Light	a170	70	180
Detroit Edison	a114½	102½	115½
|| Edison Electric Illuminating of Boston	a202	163½	201
Long Island Lighting	200	100	200
Mississippi River Power	a 37½	18	35
Montana Power	a 70½	61½	74½
Niagara Falls Power—no par	a 43	42	47
Niagara, Lockport & Ontario Power—no par	a 63	42	54
Northern Ohio Electric—no par	a 3½	5	16
Northern States Power	a104	92	106
North Texas Electric	a 65	58	84
Pacific Gas & Electric	a104½	90½	105
‡Penn Central Light & Power—no par	60	57	60½
§Pennsylvania Water & Power	128½	98½	135½
‡Philadelphia Electric—25	a 43½	29	40½
*Public Service Co. of Northern Illinois	a109	99	111½
Puget Sound Power & Light	a 55	43½	61½
Southern California Edison	a103	95	106
Tampa Electric	a172	134	170
Tennessee Electric Power—no par	a 54	20	51
Virginia Power	a 87	16	70
Virginia Railway & Power	69½	36	72½
West Penn. Co.	a111	47½	121
Holding Companies			
‡American Electric Power—50	61	22½	62½
American Gas & Electric—no par	a 76½	43½	115
American Light & Traction	a138	115	148
American Power & Light	a 61	34½	68
American Public Utilities	a 75	35	97
American Water Works & Electric	a 36½	24	41½
Carolina Power & Light—no par	a325	82½	330
Cities Service	a179	140	187
Columbia Gas & Electric—no par	a 47½	33	48
Commonwealth Power Corp.—no par	a119	56	130
Consolidated Gas—no par	a 77	60½	79½
Continental Gas & Electric	a 87	49	96
Federal Light and Traction	a136½	75	122½
General Gas & Electric	a 78	22	75
Lehigh Power Securities—no par	a114	31	110
*Middle West Utilities—no par	a 88½	41	88½
National Power & Light—no par	a223	60	247
North American—10	a 43½	22	45
Philadelphia Co.—50	a 57½	42½	57½
Power Securities—no par	a 16	4	18
Public Service Corp. of N. J.—no par	a 68½	39	70
Standard Gas & Electric—no par	a 45½	31½	41½
United Gas & Electric (Conn.)—no par	a 35	14	42
Utah Securities	a 47½	16½	46
BONDS			
Operating Companies			
Adirondack Power & Light 6s 1950	a102½	97½	103
Alabama Power 5s 1946	a 99	90½	97
Appalachian Power 5s 1941	a 96½	89	96
Brooklyn Edison 5s 1949	a 99½	97½	102½
Brooklyn Edison 6s 1930	a104½	102½	107
Brooklyn Edison 7s 1940	107½	107	110½
Cleveland Electric Illuminating 5s 1939	a 100½	98½	101
Commonwealth Edison 5s 1943	a 99½	95	101
Commonwealth Edison 5s 1953	a 98½	92	99½
§Consol. Gas, Elec. Lt. & Pwr. 4½s 1935	95½	91	96
Consumers' Power 6s 1949	a104½	102½	106
Consumers' Power 5s 1936	a 98½	94½	99½
Consumers' Power 5s 1952	a 92	87	92½
Detroit Edison 5s 1933	a101	99	101½
Duquesne Light 6s 1949	a106½	103½	106½
Great Western Power 5s 1946	95	90½	96
Kansas City Power & Light 5s 1952	a 96½	89	96½
Mississippi River Power 5s 1951	a 96½	92	97½
Montana Power 5s 1943	a 98½	95	99
New England Power 5s 1951	a101	97	101½
New York Edison 6½s 1941	a113½	109½	114½
Niagara Falls Power 6s 1950	a105½	104	106
Northern States Power 5s 1941	a 94	89½	94½
Northern States Power 6s 1941	104	101	105
Ohio Power 7s 1951	a106	103	107
Pacific Gas & Electric 5s 1942	a 94½	90½	95
Pennsylvania Water & Power 5s 1940	a 99½	96	100
‡Philadelphia Electric 5s 1966	a101½	97	103½
Portland Electric Power 6s 1941	a106½	103½	107½
Portland Electric Power 6s 1947	a 94½	89½	97
Southern California Edison 5s 1939	a 99½	96	100
Tennessee Electric Power 6s 1944	a102½	100	103½
Tennessee Electric Power 6s 1947	a100	93½	99½
Texas Power & Light 5s 1937	96½	91½	97
Toledo Edison 7s 1941	a109½	106	110
Utah Power & Light 5s 1944	a 92½	87½	93½
Holding Companies			
Alabama Traction, Light & Power 5s 1962	a 85½	65½	86
American Gas & Electric 6s 2014	a 95	94	95½
American Power & Light 6s 2016	a 94	91	94½
Amer. Water Works & Electric 5s 1934	a 93½	84½	94
Associated Gas & Electric 6½s 1954	a 97	92½	94½
Central Indiana Power 6s 1947	a 96	88	96½
Commonwealth Power 6s 1947	a 99½	87	98
Consolidated Cities Lt., Pwr. & Tr. 5s 1962	a 75½	64	76½
Illinois Power & Light 6s 1953	a100	95	101
United Light & Railways 5s 1932	94	87½	94½
United Light & Railways 6s 1952	96	92	97½
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing	a105½	90	104½
*National Carbon	a124	112	125
Worthington Pump & Machinery	85½	68	89½
COMMON STOCKS			
Allis-Chalmers Manufacturing	a 74½	41½	73½
American Bosch Magneto—no par	a 46½	22½	38½
Electric Storage Battery—no par	a 69	50½	66
General Electric	a306½	193½	301
General Electric—10	a 11½	10½	11½
*Hurley Machine—no par	a 53½	48	66
†Wagner Electric	29½	20	34½
Westinghouse Electric & Manufacturing—50	a 79½	55½	71½
Worthington Pump & Machinery	a 75½	23½	80½
BONDS			
Canadian General Electric 6s 1942	107½	102½	107½
General Electric 3½s 1942	84	80	84½
General Electric 5s 1952	a102½	100	105½
Robbins & Myers 7s 1952	68	65	91½
†Wagner Electric Manufacturing 7s	101½	97	101
Western Electric 5s 1944	a 99	96	99½
Westinghouse Electric & Mfg. 7s 1931	a107½	106½	109½

* Chicago Stock Exchange. † St. Louis Stock Exchange. ‡ Philadelphia Stock Exchange. || Boston Stock Exchange. § Baltimore Stock Exchange
a Bid price Wednesday, January 14.

connections being made for the supply of power to such places as St. Louis, East St. Louis, Alton, Hannibal, Quincy, Keokuk, Fort Madison, Burlington and other centers in Iowa, Illinois and Missouri.

Both as to gross and net earnings the Mississippi River Power Company has had an extraordinarily steady growth during the last decade, moderate gains having been reported year by year over the previous figures. Gross earnings have grown from $1,576,469 for the calendar year 1914 to $3,184,444 for the twelve months ended November 30, 1924. In other words, they have doubled. Net earnings after operating expenses and taxes in the same period have increased from $1,254,521 to $2,373,993.

Being conservatively financed and managed, the company gradually has been reducing its relative volume of outstanding securities so that the doubling in earnings during the last decade has far more than doubled the balance for reserves, retirements and dividends.

A WELL-BALANCED STRUCTURE

The Mississippi River Power Company's capital is divided about evenly as between bonds and stock, there being $21,420,700 in bonds as compared with $24,232,000 in stocks.

The first mortgage 5's of 1951, which are a lien on the company's entire property, are outstanding to the amount of $18,242,200. Interest on the bonds, which are selling on about a 5.15 per cent yield basis, is being earned well over twice. The debenture 7's of 1935, which constitute the remainder of the funded debt, are outstanding to the amount of $3,178,500. The preferred stock sells on about a 6.75 per cent basis, but the common has not yet had a dividend.

Dividends Declared

The following quarterly dividends were announced by central-station companies and electrical manufacturing companies during the past week:

Name of Company	Per Cent	When Payable	
American Light & Traction, com.	1	Feb.	2
American Light & Traction*	1	Feb.	2
American Light & Traction, pf.	1¼	Feb.	2
Central Power & Light, pf.	1¾	Feb.	1
Consumers Power, 6% pf.	$1.50	Apr.	1
Consumers Power, 6.6% pf.	$1.65	Apr.	1
Consumers Power, 7% pf.	$1.75	Apr.	1
Edison Elec. Ill. of Brockton	62½c	Feb.	2
Fort Worth Power & Light, pf.	1¾	Feb.	2
Idaho Power, pf.	1¾	Feb.	1
Illinois Northern Utilities, pf.	$1.50	Feb.	2
Lowell Electric Light	62½c	Feb.	2
Milwaukee Electric Ry. & Lt., pf.	1¼	Jan.	31
Newport News & Hampton Ry., Gas & Electric	$1.25	Feb.	2
Newburyport Gas & Electric	2	Jan.	15
Philadelphia Company	$1	Jan.	31
Pub. Serv. Co. of No. Illinois, 6% pf.	$1.50	Feb.	2
Pub. Serv. Co. of No. Illinois, 7% pf.	$1.75	Feb.	2
Public Service Co. of No. Illinois, com. par $100	$1.75	Feb.	2
Public Service Co. of No. Illinois, com., no par	$1.75	Feb.	2
Standard Power & Light, com., pf.	$1.75	Feb.	2
Tennessee Electric Power, 2d pf.	$1.50	Feb.	2
Allis-Chalmers Manufacturing, com.	$1	Feb.	16
Ingersoll Rand, com.	2	Mar.	2

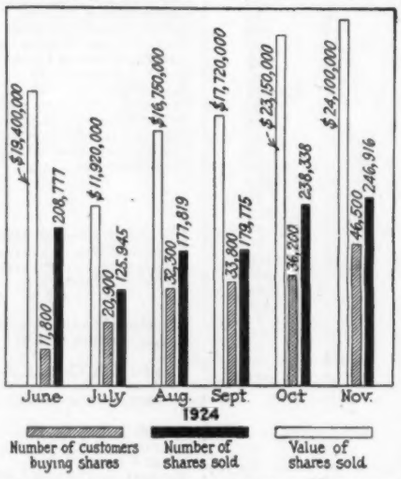
* Payable in common stock.

Austrian Company Report. — The gross earnings of the Lower Austrian Hydro-Electric Power Company during the month of November amounted to $50,300, as compared with $50,040 for the previous month. During the past year the earnings increased.

November Customer Stock Sales Total $24,100,000

Based upon monthly reports received by the ELECTRICAL WORLD from electric light and power companies selling stock direct to customers and employees, it is estimated that during November a total of 246,916 shares was sold in this manner. The total value of this stock is estimated at $24,100,000, and 46,500 customers or employees bought it. The average sale to each such purchaser amounted to $518.

During the six-month period from June to November, for which data are available, a total of 1,177,570 shares



CUSTOMER STOCK SALES DURING NOVEMBER SHOW INCREASE OVER OCTOBER FIGURE

has been sold under the customer-ownership plan. The value of this stock is estimated at $113,040,000, and it was sold to 181,500 customers or employees. There is a certain amount of duplication in the number of purchasers during the six-month period which is impossible to eliminate with the data at hand. The average sale to each customer was $623.

Columbus (Ohio) Company to Reorganize

At a meeting to be held January 27 the stockholders of the Columbus Railway, Power & Light Company will vote on approving a recapitalization plan providing for the elimination of the present authorized prior preferred stock and the substitution for the present outstanding series A preferred, series B preferred and common stock of three new classes of stock—(a) an authorized amount of 250,000 shares of first preferred stock, par $100, of which 20,276 shares will be immediately exchanged for the present outstanding series A preferred stock, share for share, the balance, being held for future issuance; (b) an authorized amount of 50,300 shares of series B preferred stock, par $100, all of which will be immediately exchanged for the present outstanding series B preferred stock; (c) an authorized amount of 300,000 shares of common stock of no par value, of which 120,825 shares will be exchanged for the outstanding common stock, on the basis of two new shares for each share held, the remainder to be held for future issuance.

This recapitalization plan has not met with the approval of all the shareholders, and a committee has been formed to fight its adoption.

Company Reports

Among the company reports issued during the past week for the month of November are the following:

Name of Company	Gross Revenues for November 1924	1923
American Water Works & Electric and subs.	$3,286,242	$3,152,030
Asheville Power & Light	88,199	79,70[illegible]
Carolina Power & Light	296,578	232,388
Eastern Shore Gas & Electric and subs.	55,253	51,307
Federal Light & Traction	500,703	489,407
Fort Worth Power & Light	258,840	271,440
Kansas Gas & Electric	480,581	504,995
Nebraska Power	356,832	344,233
New Bedford Gas & Edison Lt.	322,893	319,840
New England Co. Power Sys.	641,944	638,077
Pacific Power & Light	270,475	278,286
Southwestern Power & Light	1,116,137	1,05[illegible],126
Texas Power & Light	602,733	560,787
West Penn	2,163,386	2,104,482
Winnipeg Electric	466,889	465,9[illegible]0
Yadkin River Power	184,396	171,575

New Financing by Consolidated Gas. —The Consolidated Gas Company of New York has applied to the New York Public Service Commission for authority to issue 5½ per cent debentures, totaling $50,000,000. The purpose of the issue is to discharge obligations amounting to $8,500,000, for the acquisition of stocks and bonds of subsidiary companies amounting to $14,048,881 and to reimburse the treasury for money expended from income amounting to $27,415,118.

Utility Employees to Sell Stock.— Thirteen hundred employees of the Toledo Edison Company will participate for ten days in a customer-ownership campaign beginning January 17. Each employee will visit twenty or more customers to explain the merits of the company's 7 per cent preferred stock. It is expected that stock totaling $4,000,000 will be disposed of in this way, proceeds to be used for extensions and improvements during 1925.

Locke Insulator to Redeem Bonds.— The Locke Insulator Corporation has called for redemption on April 1 at 107½ and interest $731,200 first mortgage twenty-year sinking-fund bonds, the balance of an original issue of $750,000. To meet this obligation and that incurred last December when preferred stock to the amount of $1,000,000 was redeemed the company has sold to stockholders six-year 6 per cent notes totaling $1,000,000 and 20,000 shares of additional stock of no par value.

Rome Wire Company. — Boston bankers are offering 6 per cent sinking-fund gold notes of the Rome Wire Company, one of the largest manufacturers in the United States of copper wire and cables. The notes are due May 1, 1926, and are offered at 101½ and interest to yield about 4.90 per cent. Total net assets on December 31, 1923, amounted to $3,272 for each $1,000 of notes. Net profits before federal taxes for year ended December 31, 1923 were seven and one-half times interest charges and after taxes six and three-quarters times.